AUTOMOTIVE INDUSTRIES

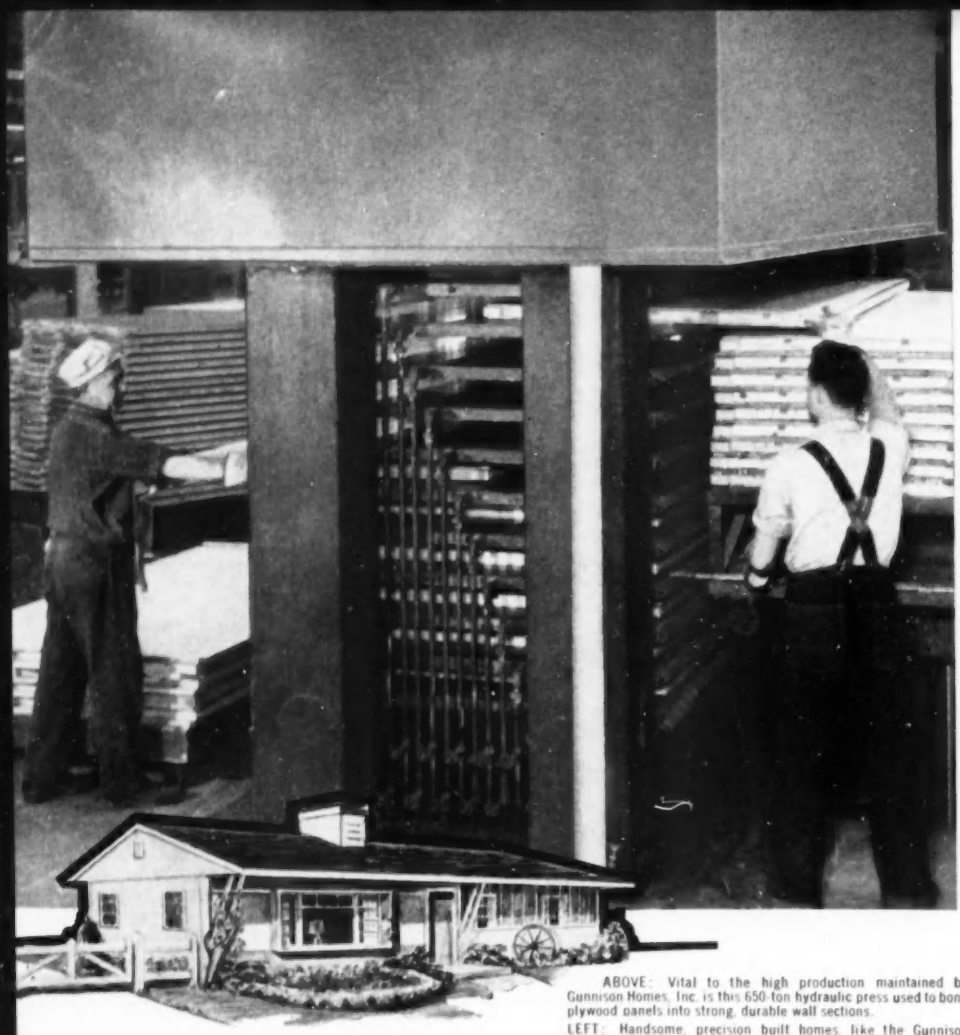
SEPTEMBER 1, 1953

AUTOMOTIVE and AVIATION MANUFACTURING
CIVILIAN AND DEFENSE
ENGINEERING • PRODUCTION • MANAGEMENT

In This Issue... Automatic Computers · · · · Surface Finishing Jet Engine Parts · · · · New Tilt Cab · · · · Oil-Type Tractor Clutch · · · · Advanced Steel Piston Ring Methods · · · · Lift Truck Automatic Transmission

COMPLETE TABLE OF CONTENTS, PAGE 3

A CHILTON PUBLICATION



ABOVE: Vital to the high production maintained by Gunnison Homes, Inc. is this 650-ton hydraulic press used to bond plywood panels into strong, durable wall sections.

LEFT: Handsome, precision built homes, like the Gunnison Coronado pictured here, are built in a matter of hours.

Answers a pressing need for Gunnison Homes, Inc....

● Gunnison Homes, Inc., situated in New Albany, Indiana, is one of the leaders in the field of manufactured homes. Key to continuous production of precision built homes at the New Albany plant is the 650-ton hydraulic press, shown above, which was installed in 1947. This press processes ten plywood panels every cycle by the combination of heat and pressure . . . a tough job and one requiring reliable hydraulic performance to maintain production schedules.

STANOIL Industrial Oil was installed in the press when it was put into operation six years ago. STANOIL has stood the test of severe operation . . . with no evidence of oil deterioration being found during a recent inspection of the hydraulic system. Operation has been efficient. Minimum make-up oil has been needed to maintain the oil capacity of 450 gallons.

STANOIL
TRADE MARK
Industrial Oil

Find how STANOIL can benefit you by discussing this multi-purpose oil with a Standard lubrication specialist. You can contact him by phoning your local Standard Oil office. Or, write: Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Ill.

What's YOUR problem?

Ralph E. Murnahan, of Standard Oil's Evansville office, is the lubrication specialist who keeps in constant contact with Gunnison Homes to make certain that there is no interruption of operation due to lubrication difficulties.

He is one of many lubrication specialists who make their headquarters in Standard's offices throughout the Midwest. These men have been specially trained in Standard's Lubrication Engineering Schools and, in addition, have a wealth of on-the-job experience.

To obtain the service of the lubrication specialist in your area, you need only call your local Standard Oil office. The lubrication specialist will discuss your lubrication problems with you . . . at no obligation to you, of course. He has a complete line of petroleum products to offer you, including:

SUPERLA Greases—Available in a wide range of consistency grades and in both lime-soap and soda-soap types. SUPERLA Greases cover a wide range of operations. These efficient products are comparable in quality with the highest type of special greases.

STANOLITH Greases—Because these unique lithium soap products possess the heat resistant properties of soda-soap greases and the water resistant properties of lime-soap greases, they offer a solution to lubrication problems caused by the presence of both heat and water.

STANDARD OIL COMPANY

STANDARD *(Indiana)*

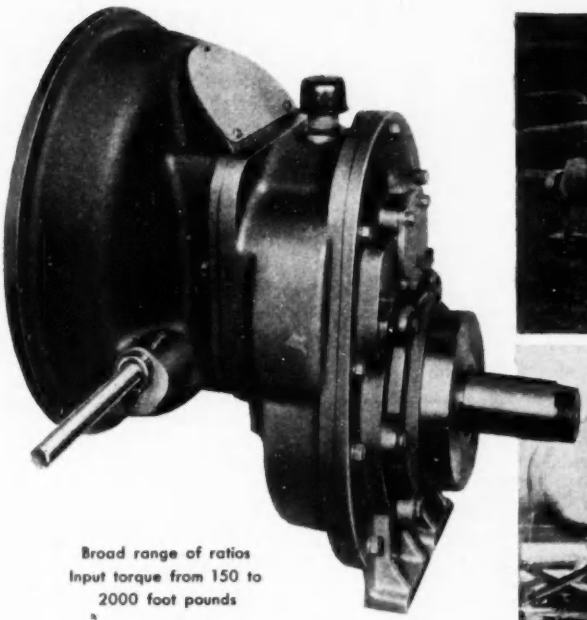
An Assurance of Dependable Service

COTTA TRANSMISSION CO.

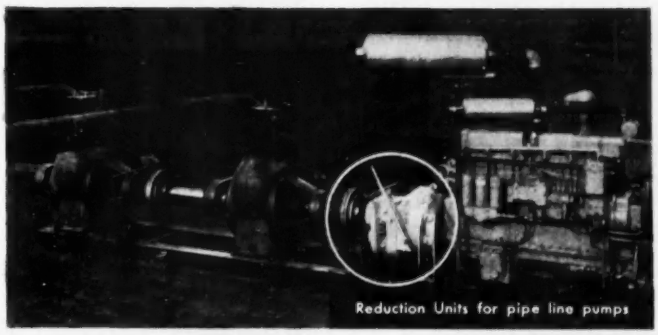
2340 Eleventh Street

Rockford, Illinois

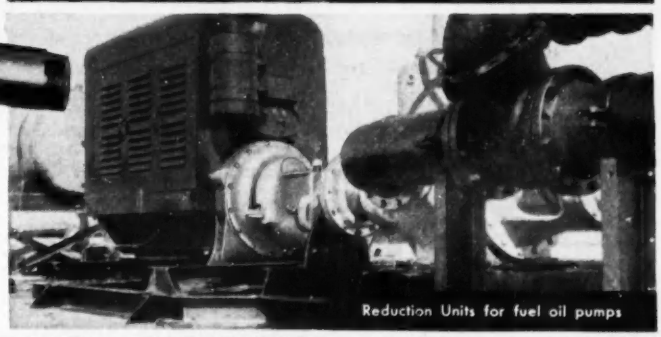
HOW COTTA TRANSMISSIONS AND REDUCTION UNITS SERVE THE PETROLEUM INDUSTRY



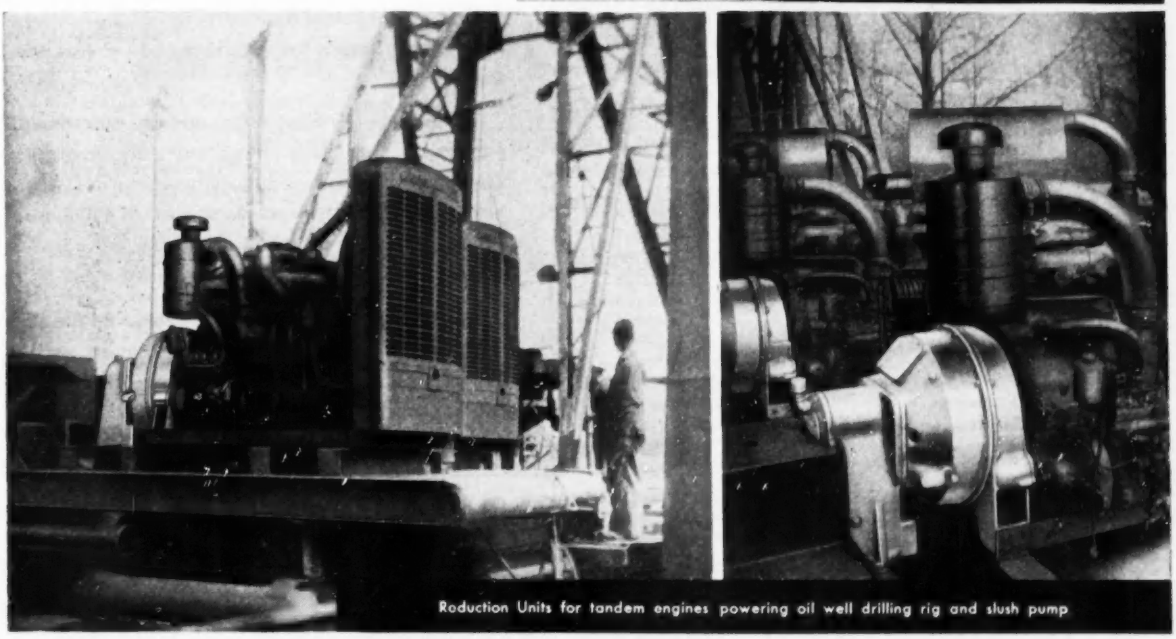
Broad range of ratios
Input torque from 150 to
2000 foot pounds



Reduction Units for pipe line pumps



Reduction Units for fuel oil pumps



Reduction Units for tandem engines powering oil well drilling rig and slush pump

other applications: cranes, shovels, rock crushers, generators, etc.

After 199,000 miles of service... fleet owner reports "no appreciable wear" on Ni-Resist armored ring band pistons used in Buda Model 844 heavy duty engine. This user, operating 738 Diesel powered freight trucks and trailers in mountainous territory, expects considerably more mileage before replacing pistons of this type.

After 41,078 miles... the top ring groove failed in this conventional-type aluminum piston. Records show distinct improvements attained by use of armored ring bands of Ni-Resist which become an integral part of pistons when bonded to the aluminum alloy by the Al-Fin process, developed by FAIRCHILD ENGINE AND AIRPLANE CORP.

5 times the mileage with Ni-Resist* ring grooves

A large fleet owner, operating gasoline engine powered trucks and trailers in the Rocky Mountain area averages 250,000 miles per set of aluminum pistons with bonded-in Ni-Resist® ring bands.

This is a typical performance, as shown by numerous reports reaching UNITED ENGINE & MACHINE COMPANY, San Leandro, California, a pioneer in producing Ni-Resist armored ring band pistons, sold under the trade-name DUALOY.

Some of these bi-metallic pistons are now in their third 250,000 mile operating runs after being twice reground to the next smaller oversize.

Use of Ni-Resist eliminates ring groove wear troubles. Accordingly, it helps to prevent blow-by and reduces oil consumption. In addition, it resists corrosive attacks from chemically treated fuels.

Maximum piston life made possible by using Ni-Resist ring bands results in additional profit from increased mileage between overhauls... and substantial reduction of downtime expense.

Ni-Resist is specified because it combines outstanding resistance to heat, corrosion, metal-to-metal wear and galling. Equally important is the high thermal expansion of Ni-Resist Type 1 which nearly matches that of the aluminum piston alloy.

Other established Ni-Resist engine applications are cylinder liners, valve guides and exhaust system parts.

Investigate Ni-Resist for original equipment parts when designing new heavy duty engines — also for any problems involving corrosion, wear, heat and other destructive forces. We'll gladly supply you with information on the varied uses and types of Ni-Resist.

At the present time, nickel is available for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.

* *No other cast metal provides such a useful combination of engineering properties.*

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC. AI-9-1-53
Dept. 20, 67 Wall Street, New York 5, N. Y.
Please send me booklets entitled, "Engineering Properties and Applications of Ni-Resist," and, "Buyers' Guide for Ni-Resist Castings."

Name _____ Title _____

Company _____ Address _____

City _____ State _____

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

SEPTEMBER 1, 1953 VOL. 109, NO. 5

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FEATURES

Automatic Controls for Surface Finishing Jet Engine Parts. *By R. J. Thomas* 48
Rate of Turning Crankshafts Is Increased 51
Solving Automotive Problems with Automatic Computers. *By A. W. Jacobson and H. D. Huskey* 52
Building Bus Bodies. *By Joseph Geschelin* 58
Automatic Transmission for Fork-Lift Truck 62
Advanced Methods for Making Steel Piston Rings. *By Joseph Geschelin* 64
Cutting Abrasive Costs in Body Plants. *By J. R. O'Neil and W. J. Swallow* 66
Caterpillar Develops Oil-Type Tractor Clutch 69
Diamond T Tilt-Cab Requires No Power 70
Forming Exhaust Pipes with Timesaving Equipment 72

NEWS PREVIEWS

Cadillac Tells Details of Experimental Car 33
New Model Changes to be Extensive 33
Truck Prices Adjusted 33
Used Car Market Shows Uptrend 34
Ford Decentralizes Highland Park Unit 34
Rapid Improvising Marks GM Effort After Fire ... 35
Defense Plants Plan Idle Tool Storage 36
Air Conditioner Firms May Invade Auto Field 36
Buick Engine Plant Tooling Completed 37
Kaiser May Drop Chase 38
Electric Auto-Lite Expands Abroad 38
Foreign Cars Sales Jump 30 Per Cent 39
British Reveal New Jet, Longer Life Ghost 98

DEPARTMENTS

High Spots of This Issue 31
News of the Automotive and Aviation Industries 33
Men in the News 40
Machinery News. *By Thomas Mac New* 79
New Production and Plant Equipment 81
New Products 87
Free Literature and Free Information Service 89
New Products for Aircraft 92
Metals. *By William F. Boericke* 94
Observations. *By Joseph Geschelin* 96
Shorties 114
Calendar of Coming Events 116
Washington Wire 138

Business Department Staff 31
Chilton Officers and Directors 31
Advertisers' Index 160

MEMBER — Society of Business Magazine Editors — SBME

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NBP National Business Publications, Inc.

ABC Audit Bureau of Circulations

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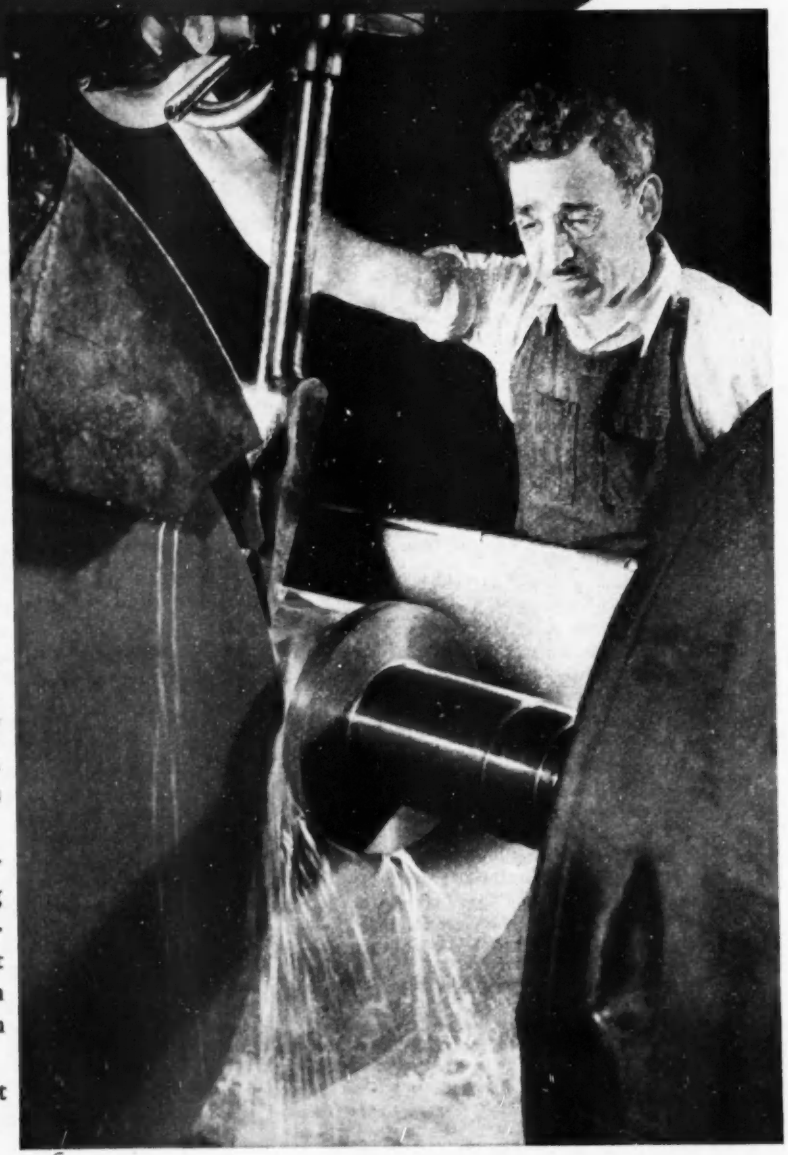

WHEN YOU USE *Texaco Grindtex Oil* or one of the soluble oil emulsions recommended for your particular work, you get a marked improvement in results.

Texaco Soluble Oil D, for example, makes a remarkably stable grinding emulsion that keeps the work cool and prevents distortion from frictional heat. It permits grinding dirt to settle out quickly, assuring a wheel that stays free-cutting longer. And you'll get a finish that is rust-free and smoother.

For machines that are hydraulically controlled, make your hydraulic medium *Texaco Regal Oil (R&O).* It keeps systems free from rust, sludge and foam, assures smoother operation.

Let a Texaco Lubrication Engineer specializing in metal working help you do *all* your machining better, faster, and at lower cost. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

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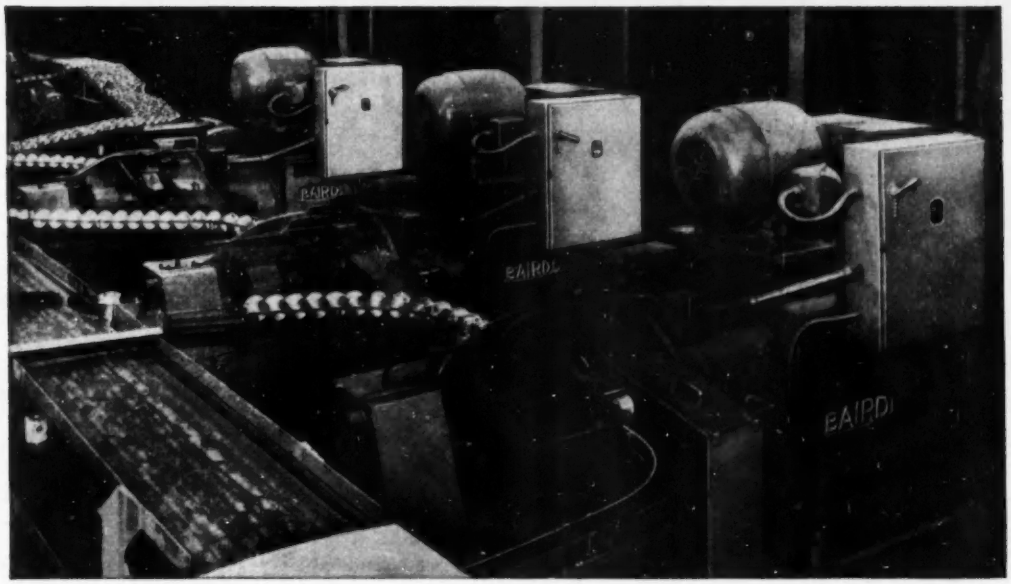
TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING



BAIRD *Automatic* CHUCKING MACHINES
Join mass production lines at new FORD plant

The Baird Machine Company is pleased to share, with other manufacturers of modern automatics, in the high speed production at the Ford Motor Company's new Cleveland Engine Plant.

Shown above is a battery of Baird Chucking Machines. They completely finish-turn the engine piston, and finish the oil ring grooves to size. Machines are automatically loaded from the conveyor and automatically discharge the pistons when they are completed. Operations are fast, continuous, and to close-tolerance machining.

The Baird 76H Chucker (7"-chuck, 6-spindle, horizontal machine) combines, in a single automatic indexing cycle, such operations as turning, facing, drilling, tapping, threading, grooving, and chamfering . . . if desired. Automatic electrical and mechanical safety devices prevent damage when setting up, when loading is not within cycle time, or when any motions are out of sequence.

Other valuable features are: easy access to all tooling, individual tool slides, individual spindle speeds, automatic chucking, maintained accuracy over a long service life.

If you require repetitive production of this nature . . . either hand load and unload, or entirely automatic . . . ask Baird engineers for details.

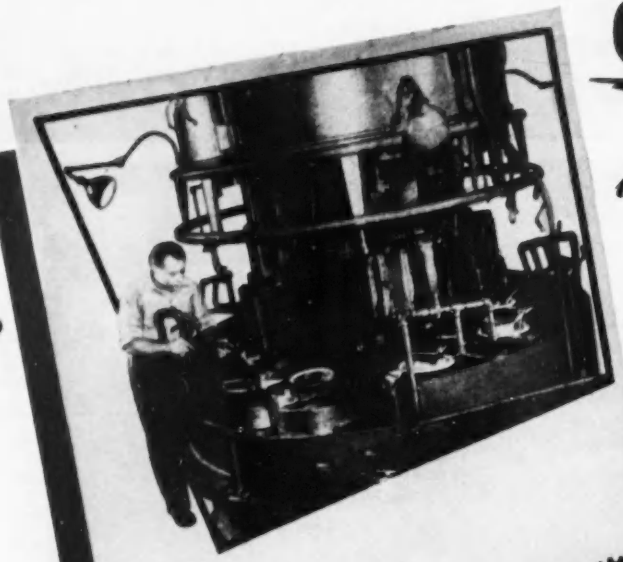
the **BAIRD MACHINE COMPANY**
STRATFORD • CONNECTICUT

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TOOLING BARRELS

. . . a customer speaks with

CONFIDENCE

in his manufacturing equipment



Quantity Production . . .

• Quantity production of identical gears offers a challenge that we here at BRAD FOOTE are eager to accept.

• Multiple spindle machines, duplicate machines, numerous and varied machines, every machine that's needed—PLUS men of long experience making close tolerance gears . . . these factors make it possible for us to confidently accept such a challenge.

• When you specify BRAD FOOTE gears, you do so with the knowledge that each gear will be made to exact specifications; that every gear of a quantity will be identical in structure, in size, and in appearance; that each operation on every gear will be performed by BRAD FOOTE people in BRAD FOOTE shops. No one will share our responsibility.

• You will be satisfied with the BRAD FOOTE gears you buy because they will give long, economical service on the ... you operate, or on the machines you sell ...

• Your inquiries ... invited.

BULLARD
Mult-Au-Matics

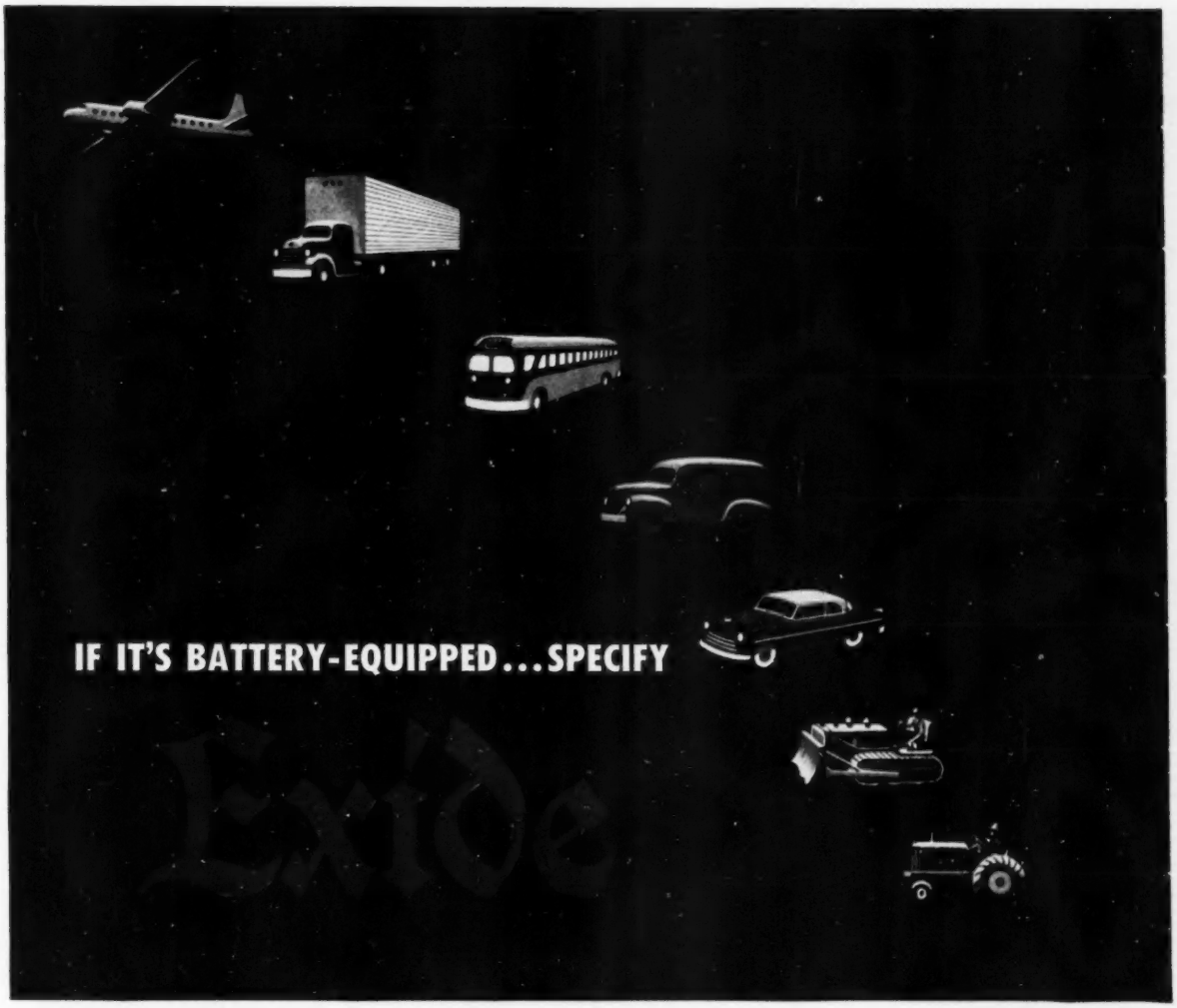
have earned this confidence in many plants.

Mult-Au-Matic accuracy and efficient production are key notes from satisfied users.

Where others profit from Mult-Au-Matic installations, you too can benefit. Ask Bullard for surveys on your work.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

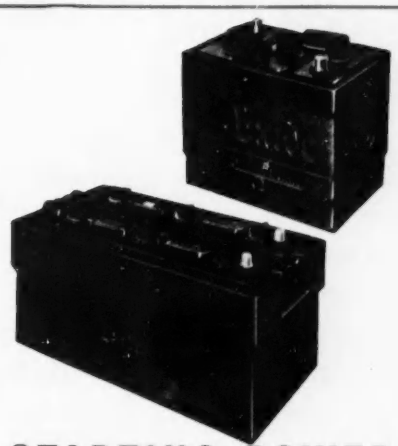


With Exide batteries your equipment will always get off to a good start: automobiles, trucks, tractors, off-the-highway equipment, aircraft and watercraft. In operation, Exide batteries offer exceptionally low maintenance cost . . . dependable year-round performance.

Today's Exide battery is the product of years of progressive research-engineering, and proved by intensive testing under both laboratory and actual field conditions.

Exide engineers, working in the largest and most modern laboratories in the battery business, will cooperate with you on any storage battery problem.

1888...DEPENDABLE BATTERIES FOR 65 YEARS...1953



STARTING POWER

for light, medium, or heavy-duty service

THE ELECTRIC STORAGE BATTERY CO., Philadelphia 2 • *Exide Batteries of Canada, Limited, Toronto*

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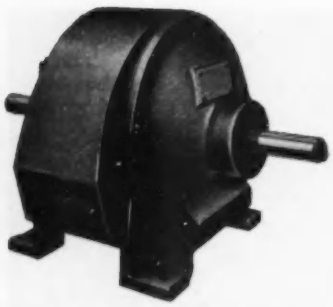
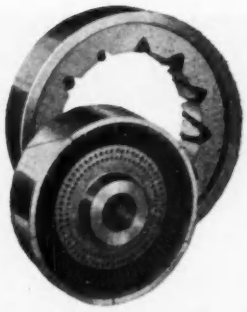
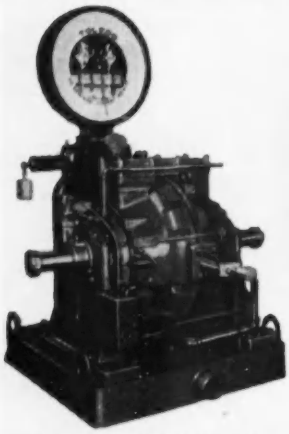


AIR COOLED COUPLINGS

AJUSTO-SPEDE MOTORS



AIR COOLED BRAKES

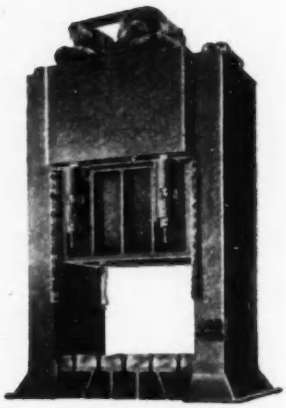


ABSORPTION DYNAMOMETERS

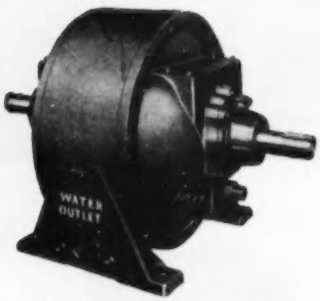
EATON

DYNAMATIC

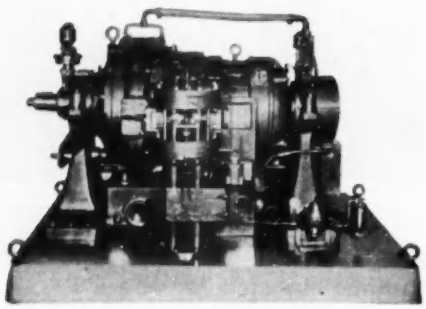
EDDY-CURRENT ROTATING EQUIPMENT



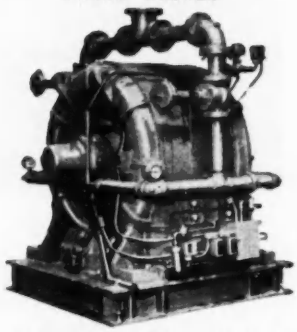
PRESS DRIVES



LIQUID COOLED COUPLINGS



UNIVERSAL DYNAMOMETERS



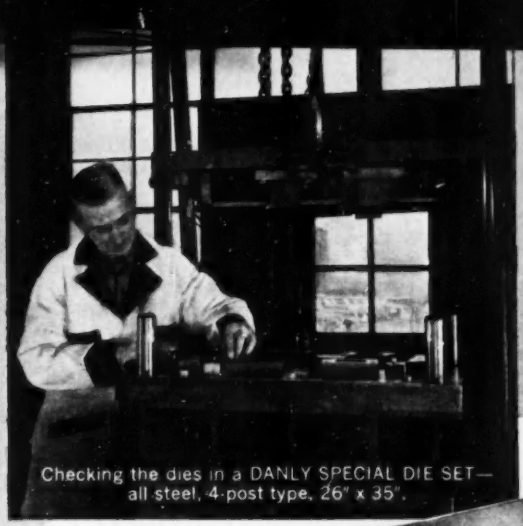
LIQUID COOLED BRAKES

Dynamatic Eddy-Current electro-magnetic equipment represents the ideal solution for a wide range of adjustable-speed drive problems, particularly where an AC power source is a requirement. Typical applications include paper machine drives, cement mill drives, industrial truck clutches, press drives, crane brakes, fan drives—in fact, practically all test, processing, and conveying equipment common to industry. Instantaneous response and accurate control are important advantages.

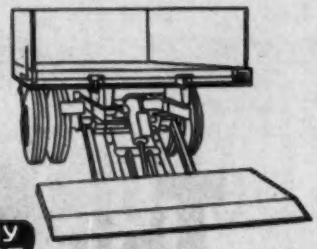
Write for your copy of Bulletin GB-1 which describes and illustrates the basic Dynamatic units.

DYNAMATIC CORPORATION KENOSHA • WISCONSIN

Subsidiary of EATON MANUFACTURING COMPANY, Cleveland, Ohio

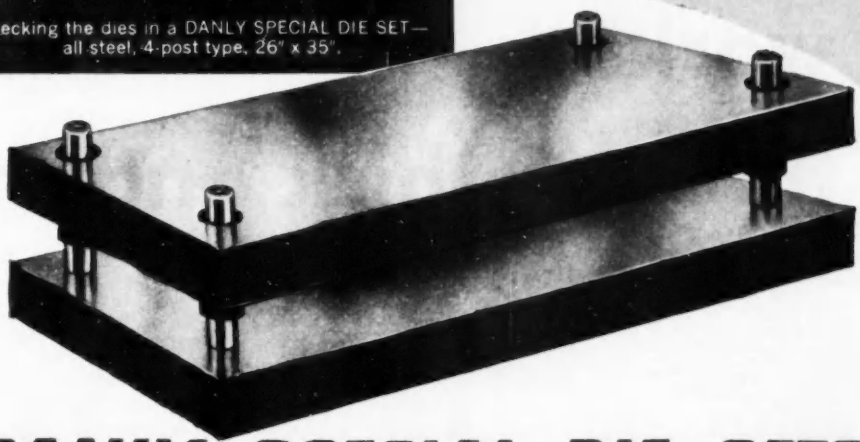


Checking the dies in a DANLY SPECIAL DIE SET—all steel, 4-post type, 26" x 35".



ANTHONY LIFT GATE HYDRAULIC

SHOWN IN LOADING POSITION



DANLY SPECIAL DIE SETS

View showing DANLY SPECIAL DIE SET during production run. Tail gate gussets are blanked and pierced in a single stage operation from 10 gage blue annealed sheet.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS SUPPLIES

help Anthony give industry a lift!

For years now, the Anthony Company, makers of hydraulic lift gates for motor trucks, has relied on Danly Special Die Sets in their production operation. Based on long experience, they've found that Danly Special Die Sets cut their tooling costs and save time . . . because they provide the finest precision starting point for diemaking. Why not build your production dies in Danly Special Die Sets? . . . see what die performance can really mean.

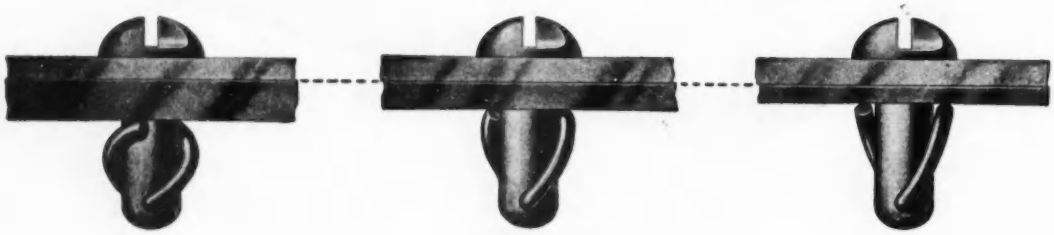
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT—CALL YOUR NEAREST DANLY BRANCH

*CHICAGO 50	2100 South Laramie Avenue
*CLEVELAND 14	1550 East 33rd Street
*DAYTON 7	3196 Delphos Avenue
*DETROIT 16	1549 Temple Avenue
*GRAND RAPIDS	113 Michigan Street N.W.
INDIANAPOLIS 4	5 West 10th Street
*LONG ISLAND CITY 1	47-28 37th Street
*LOS ANGELES 54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2	111 East Wisconsin Avenue
*PHILADELPHIA 40	511 W. Courtland Street
*ROCHESTER 6	33 Rutter Street

*Indicates complete stock

This fastener works through thick and thin!



Spring-Lock—the easy-to-use removable fastener for modern designs—works whether panel thicknesses run over or under specifications! Spring wire deflects automatically to handle greater or lesser thicknesses. Spring-Lock's design flexibility makes it more than a fastener: it can be adapted as a shelf support, door strike, knob or any similar panel-mounted device. Many standard shapes and sizes of Simmons Spring-Locks are available from stock.

SIMMONS FASTENER CORPORATION

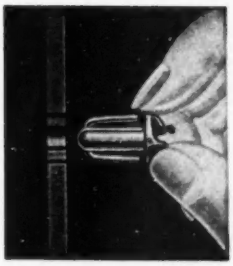
1749 North Broadway, Albany 1, New York

Simmons

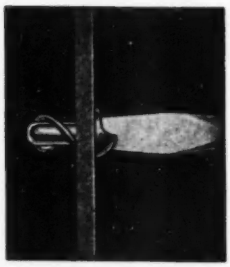
QUICK-LOCK
SPRING-LOCK
ROTO-LOCK
LINK-LOCK
DUAL-LOCK

JUST OUT!
NEW 36-PAGE CATALOG WITH APPLICATIONS
SEND FOR IT!

HERE'S HOW SPRING-LOCK WORKS



1. *Insert fastener.*



2. *Half-turn locks it in place.*

With production costs on the uptrend, you can figure on Spring-Lock as an assembly time and money-saver, because:

- **Installation is BLIND**
- **Installation is EASY: no special tools are needed**
- **Installation is QUICK: a half-turn locks it in place**
- **Installation is SECURE: the *spring* steel *locks* the fastener, resists vibration**

Send for details and samples, or write us about *your* fastening problem.

When Are You Justified in Using a Special Alloy Steel?

Probably not more than 5 pct of all alloy-steel applications justify the use of special grades. And these relatively few cases are the ones in which the main properties sought are resistance to heat, or corrosion, or low-temperature impact. Generally speaking, there are no other advantages to be gained by using special grades of alloy steel.

In the remaining 95 pct of all applications, whether civilian or military, the standard AISI grades of alloy steel will meet the usual requirements for strength, hardness, and ductility.

There are two big advantages in using standard grades. (1) Their chemical ranges usually fall within closer limits than those of the non-standard grades. This means that standard methods of heat-treatment can be used, and the results can be predicted to a closer degree. (2) Smaller tonnages of standard grades can be bought, eliminating the need for large, costly inventories. A non-standard grade is produced and sold only in heat lots.

If you have any kind of problem concerning alloy steels, their heat-treatment or applications, you can count on our metallurgists for unbiased advice. We manufacture and sell the entire range of AISI standard grades of alloy steel, as well as special-analysis steels and carbon steels.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

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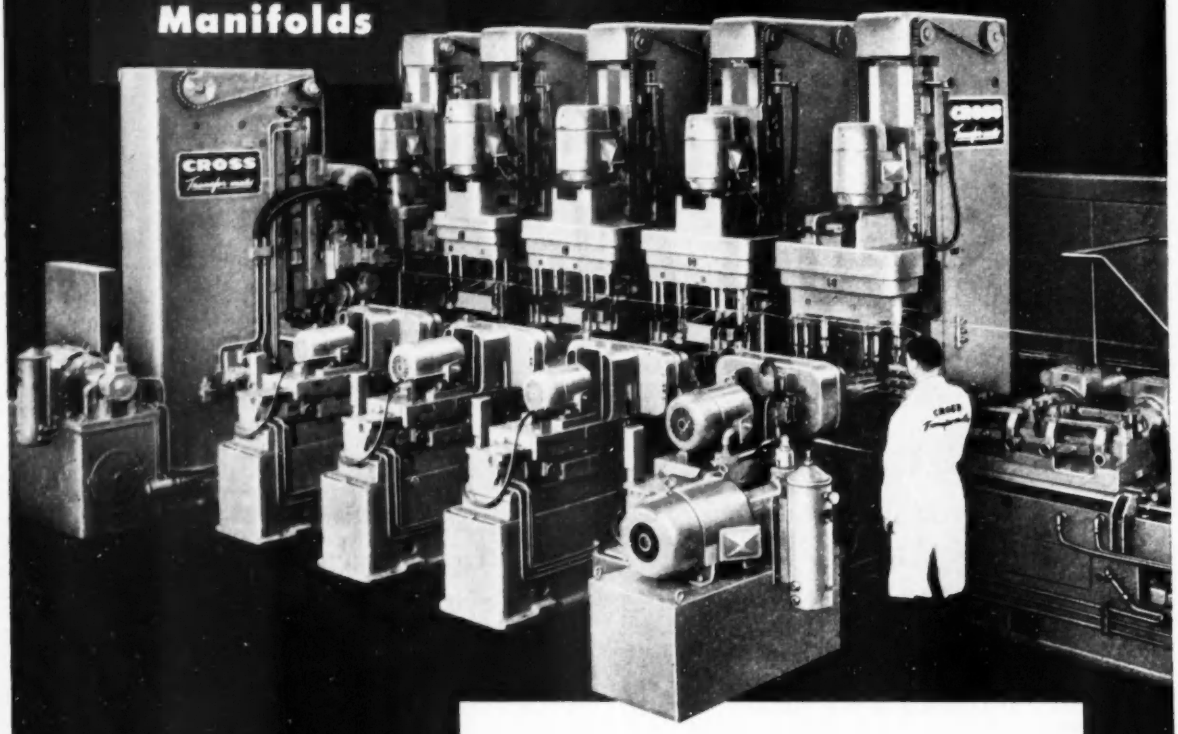
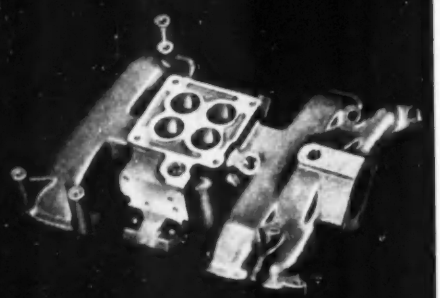
BETHLEHEM STEEL

Drills, Bores, Mills, Intake Manifolds

Another Transfer-matic by Cross





★ 218 parts per hour at 100% efficiency.

★ Seven stations including loading and unloading.

★ 54 operations—22 drilling, 8 chamfering, 2 reaming, 12 tapping, 8 boring and 2 milling.

★ Two parts machined at one time in each station.

★ Palletized work holding fixtures and automatic transfer from station to station.

★ Power wrenches for automatically operating work holding fixtures.

★ Other features: Pre-set tools, built-in chip conveyor, automatic cleaning unit for removing chips from fixtures, J.I.C. Standard Construction.

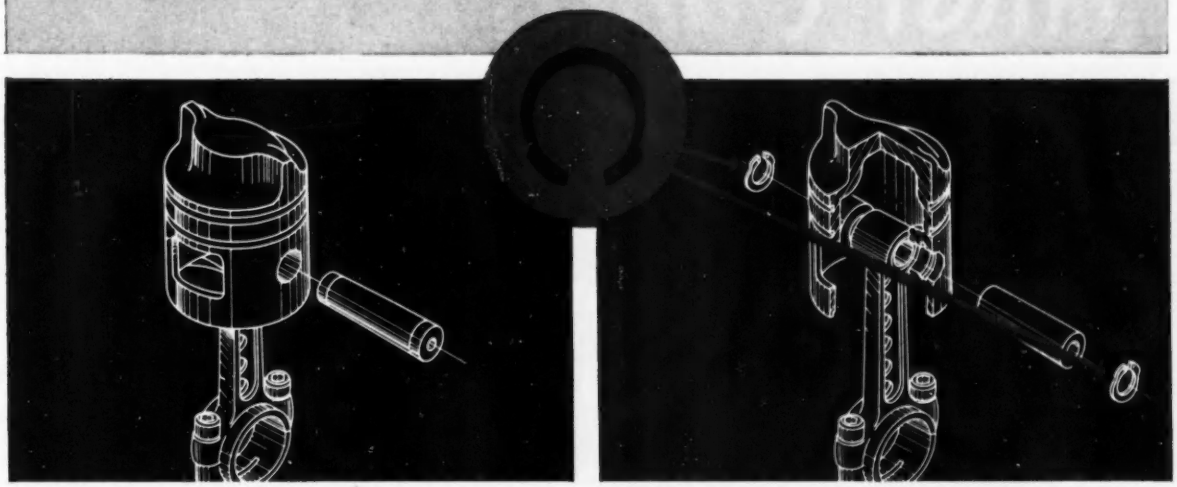
Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

2 Waldes Truarc Rings Replace 2 End Plugs ...Eliminate 3 Operations...Save $.066 Per Unit



OLD WAY Two inserted-plug type wrist pin locks hold wrist pin in place. 3 operations involved: costly machining, pressing in place, post-assembly machining. Costly maintenance problem—resulting from end plugs hammering loose.

TRUARC WAY Two Truarc Inverted Retaining Rings (Series 5008) hold wrist pin in place. Truarc Rings snap into grooves easily cut in piston, provide positive lock . . . practically eliminate maintenance costs. Quick assembly, disassembly.

Titan Chain Saws, Inc., Seattle, Washington, uses 2 Waldes Truarc Rings to replace old-style inserted-plug type wrist pin locks in their Titan chain saws. Use of Waldes Truarc Retaining Rings eliminates 2 press fit end plugs. Machining of plugs, pressing in place, finish machining—no longer required. Truarc way holds rejections to a minimum. Unit efficiency is greatly increased.

Redesign with Truarc Rings and you, too, will cut costs. Wherever you use machined shoulders, bolts, snap rings, cotter pins, there's a Waldes Truarc Retaining Ring designed to do a better job of holding parts together.

USE OF 2 WALDES TRUARC RINGS PERMITTED THESE SAVINGS PER UNIT:

OLD WAY	
Cost of 2 end plugs Cost of pressing in and machining	$ .169
TRUARC WAY	
Cost of grooving piston Cost of 2 Truarc Rings	.103
Saving per Unit	**$ .066**

Waldes Truarc Rings are precision-engineered . . . quick and easy to assemble and disassemble. Always circular to give a never-failing grip. They can be used over and over again.

Find out what Waldes Truarc Retaining Rings can do for you. Send your blueprints to Waldes Truarc engineers for individual attention, without obligation.

For precision internal grooving and undercutting . . . Waldes Truarc Internal Grooving Tool.

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WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,416,852; 2,420,921; 2,428,341; 2,439,765; 2,441,846; 2,455,185; 2,483,300; 2,483,393; 2,487,802; 2,487,803; 2,491,308; 2,509,081 AND OTHER PATENTS PENDING.

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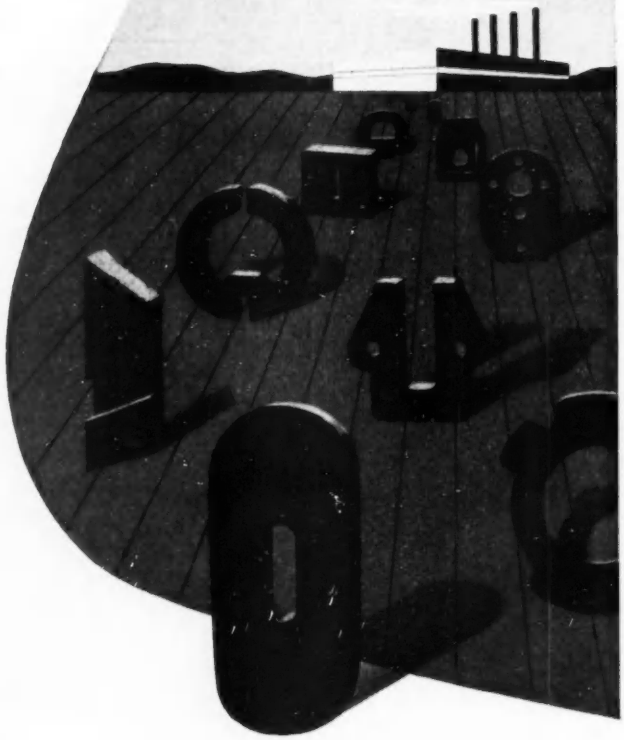
Western Felt engineers with decades of experience in the use of felt stand ready to counsel you.



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In this business of fighting increasing costs . . . the production of machines, particularly grinders, gets a long look . . . for its here that operational costs *can* be reduced. Even when rejections are low and machine efficiency high—it's a good bet that Delpark Filtration can pull the rejection rate much lower and push that machine to near absolute efficiency.

It's an equally good point to remember that so goes the efficiency of *your* equipment . . . so goes the profit on *your* ledger. It's an extra good point to remember, too, that numerous case histories show Delpark Filters consistently amortize themselves in less than a year.

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Backed By More Than 30 Years Experience In Industrial Filtration

Delpark Filter installation on Special Cincinnati Centerless Grinder in the High Standard Plant

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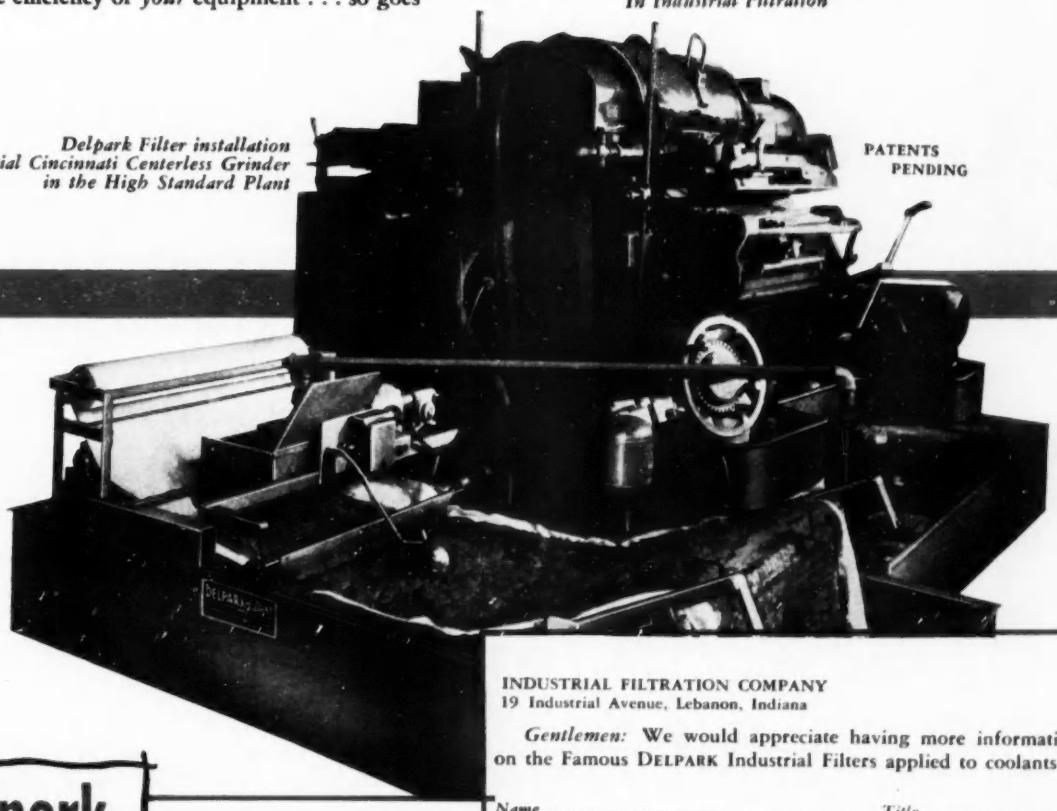

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INDUSTRIAL FILTRATION COMPANY
19 Industrial Avenue, Lebanon, Indiana

Gentlemen: We would appreciate having more information on the Famous DELPARK Industrial Filters applied to coolants.

Name..... *Title*.....

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—backbone of the internal combustion engine.

Modern Trends—more r.p.m.'s, higher compression ratios, more power per cubic inch of displacement—all lend additional emphasis to the importance of crankshaft quality.

Wyman-Gordon Experience—the most extensive in the industry, assures the maximum in physical properties, uniform machinability, and balance control.

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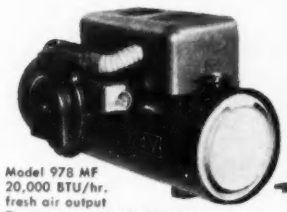


Model 978 MF
20,000 BTU/hr.
fresh air output
Total output, 30,000 BTU/hr.

even at 65° below!

powerful! compact! economical!

heater provides engine starting—cab heating—defrosting!

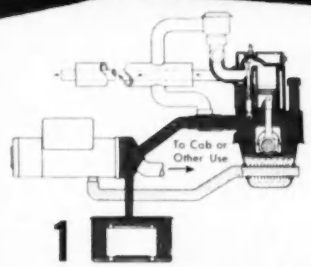
Now! South Wind Pre-Heating Systems bring to any gas or diesel engine the same quick, reliable engine starting that major aircraft and military vehicles enjoy! Marking an entirely new era in pre-heating, South Wind Heaters make starting easier at *all* temperatures—*even 65° below!* Lower maintenance costs—prolong engine life!

Never before such power—such compactness—such efficiency! These heaters provide *engine starting—cab heating—defrosting!* South Wind Pre-Heating Systems reduce battery drain by reducing starting torque—cut the cost of starting aids. Eliminate the shock loads imposed by brute-force starting methods, too.

South Wind Pre-Heating Systems deliver clean, *dry* air to engines. Permit use of optimum viscosity lubricants. Assure normal lubrication at all times. Remove moisture—inhibit sludge formation and freeze-up of engine accessories.

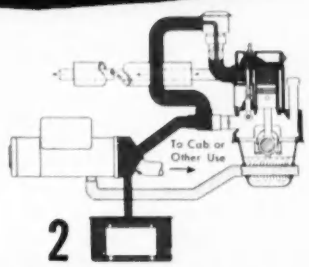
South Wind Heaters include units of 20,000, 30,000, 50,000, 60,000, 100,000, 200,000, 600,000, and 700,000 BTU/hr. capacities. There is a model to meet every internal or external pre-heating requirement. South Wind field engineers are ready to consult with you on any specific problems you may have. Write today to South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

South Wind 3-phase internal pre-heating



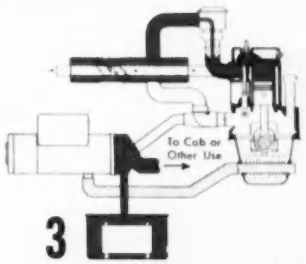
1

Pre-Heat Phase—Clean, *dry*, hot air is used to pre-heat critical engine moving parts *directly* and to remove damaging moisture *from engine interior—before engine cranking is attempted.* (Note: Heat duct to cab for defrosting and cab heating is closed until after engine is started.)



2

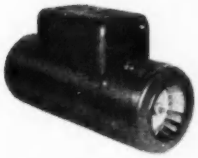
Starting Phase—Heat into engine crankcase is diverted (as shown) to air induction system to elevate temperature of fuel-air mixture and promote rapid, normal combustion in chambers. Internal pre-heating of critical parts and normal lubrication frees bearings, shafts, pins and pistons from starting strain and friction wear.



3

Operational Phase—After easy starting, normal engine operating conditions are sustained. Now, South Wind's clean heat can be used to heat the cab, defrost windshield and supply engine induction air heat. (Note: illustration shows how normal engine induction air temperature can be sustained by engine exhaust heat exchanger.)

Model 1060
60,000 BTU/hr.
fresh air output
Total output,
90,000 BTU/hr.



Model 1030
30,000 BTU/hr.
fresh air output
Total output, 50,000 BTU/hr.

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South Wind

PERSONNEL HEATING
ENGINE AND EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING

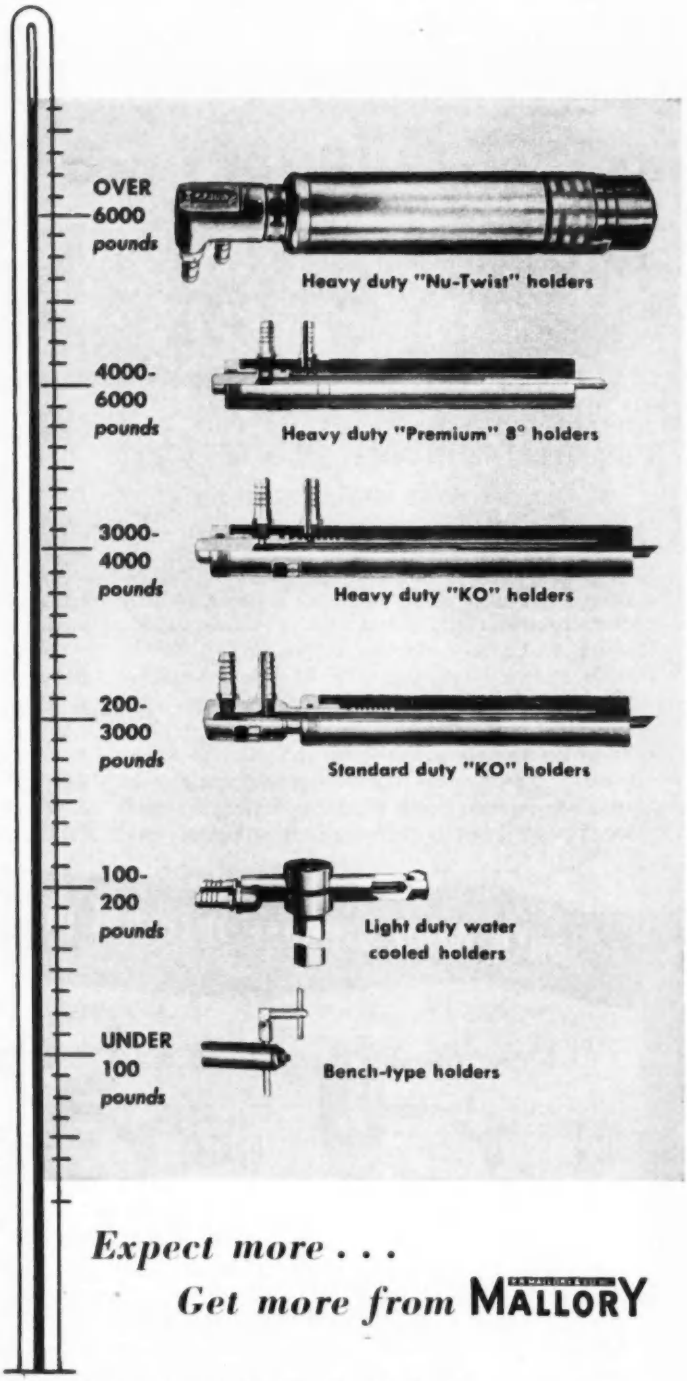
You Name The Welding Pressure . . . .

Mallory has the holders and electrodes in stock

Resistance welding pressures from under 100 pounds to over 6,000 pounds can be handled by standard Mallory holders and electrodes . . . available from stock. The new Mallory "Nu-Twist"* holders and electrodes will perform in the high pressure ranges needed for welds to meet all present military specifications . . . as well as the most demanding commercial requirements.

Because holders and electrodes are available in a wide variety of shapes and sizes, standard units can be combined to handle practically any resistance welding job without the cost or delay of special designs.

Like to see our complete line? Then write to us, or have your Mallory distributor drop by with a copy of Catalog 550C. See for yourself the complete range of holders, electrodes and accessories that are on the shelf for immediate delivery.



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LINCOLN FINDS

Brass is Best

Kitchen range burner valve by Lincoln Brass Works, Inc., Detroit 16, Mich. Two different brasses are used in this valve, which is entirely of brass except for the washer and spring. Lincoln also makes valves for heaters and furnaces; flow, drain and shut-off valves for gasoline lines; shut-off valves for agricultural sprayers, and a wide variety of tube and pipe fittings, all entirely or chiefly of free-cutting brass rod and free-machining brass forgings.

Mr. D. E. DuPerow, Vice-President of Lincoln Brass Works, Inc., recently said: "Thirty-six years of brass use by Lincoln and complete acceptance by the trade is the best reason I can think of for brass superiority. If there had been any material better for our purpose, less expensive to fabricate, and more desirable to our customers, we would be using it now."

Brass has many desirable characteristics. Here are five of them that are important in Lincoln valves and fittings: 1, corrosion resistance, which means no plating is required. 2, high speed precision machining for high output, lower costs. 3, sound, non-porous structure of rod and forgings. 4, smooth performance; brass holds lubricants. 5, customer satisfaction; gas range burner valves pass the cycling test of being raised to 425°F. and back to room temperature a minimum of 10,000 times without seizure, loss of free operation, or leakage.

There are many other items besides valves that can profitably make use of the fine qualities of Revere Brass. The Revere Technical Advisory Service will gladly cooperate with manufacturers on the selection of the correct brass and its fabrication. Just call the nearest Revere Sales Office; see your telephone directory. Or write direct.

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COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere

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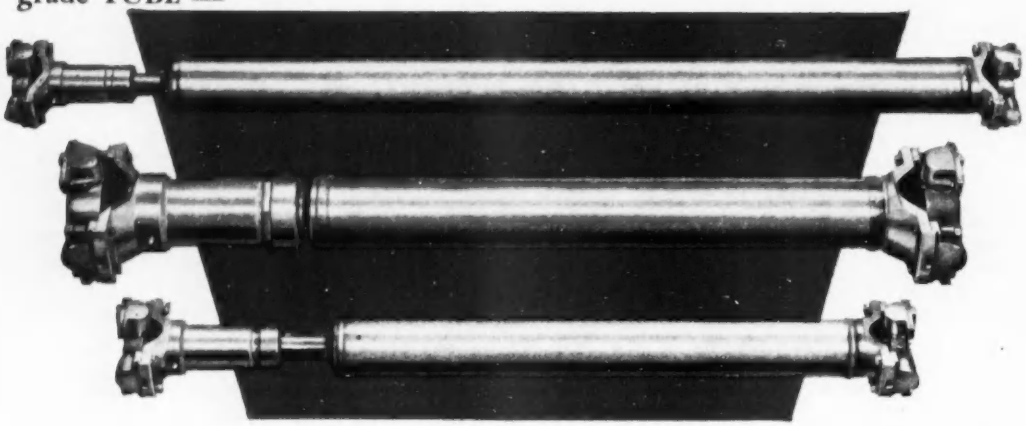
LARGE SIZE JOINTS + LONG PROPELLER SHAFT = LESS TRUCK WEIGHT

If your truck must have large size universal joints — with a long propeller shaft—and operate at high speeds—it will pay you to specify MECHANICS "C" Type UNIVERSAL JOINTS with a 4″ or 4½″ diameter PROPELLER grade TUBE —



This combination provides strong, smooth running drive lines — with a substantial reduction in weight. Let MECHANICS engineers help develop a stronger, lighter, smoother running drive line for *your* truck, or other heavy duty equipment.

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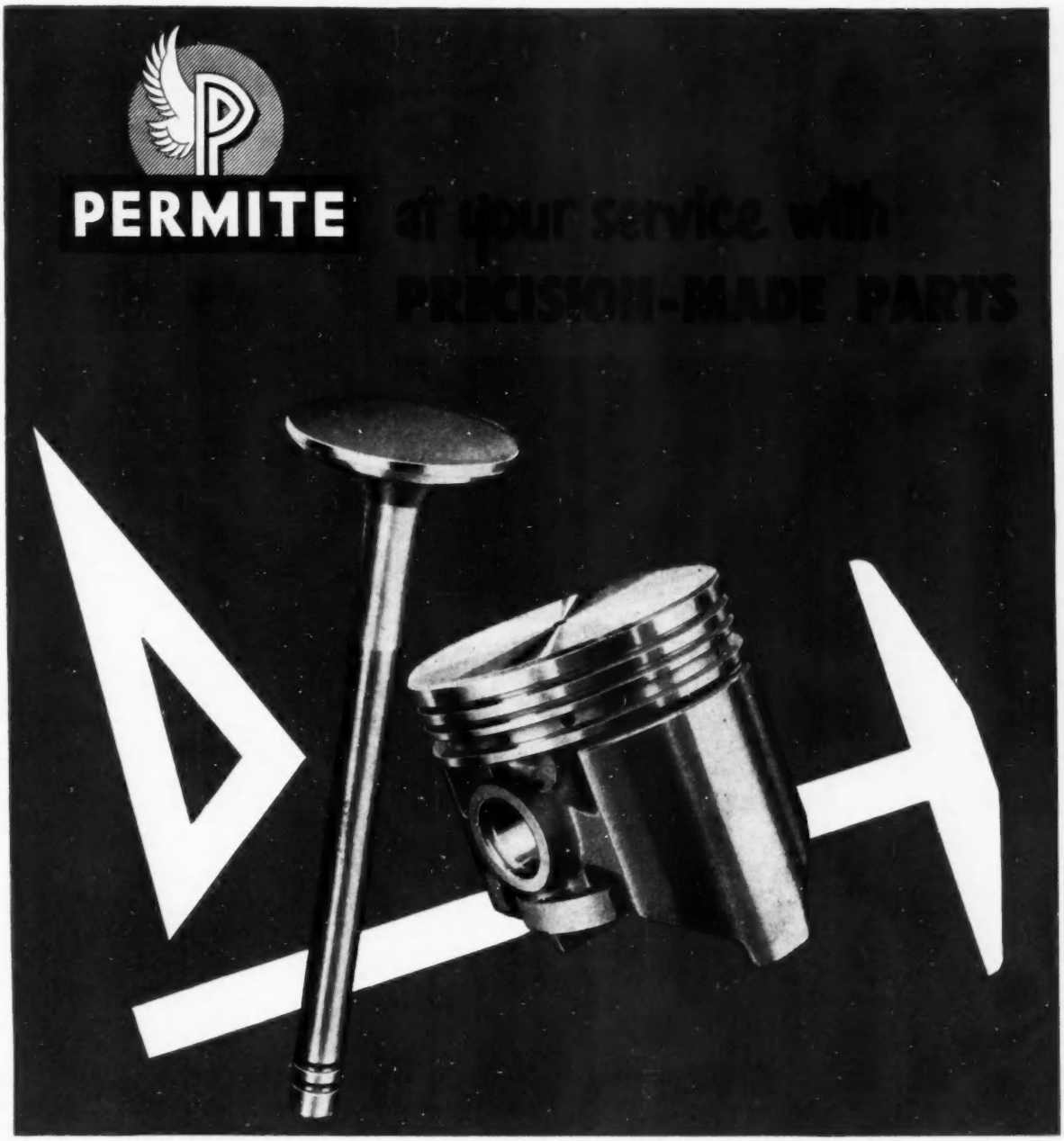
MECHANICS *Roller Bearing* UNIVERSAL JOINTS

For Cars • Trucks • Tractors • Farm Implements • Road Machinery • Aircraft • Tanks • Buses and Industrial Equipment



Year after year, leading manufacturers of passenger cars, trucks and buses use Permite Pistons and Permite Valves as original equipment. They know they can depend upon Permite precision engineering, Permite long automotive experience, and Permite facilities, for quality parts that will help them maintain production schedules. They have found that they can count on parts that fully meet today's advanced standards for outstanding performance and exceptional wearing qualities.

Permite design and production engineers gladly work with automotive manufacturers' engineering staffs on problems concerning their requirements for pistons, valves and other engine parts to promote top performance. Inquiries are invited. Write us at any one of the addresses below.

ALUMINUM INDUSTRIES, Inc. . . . Cincinnati 25, Ohio

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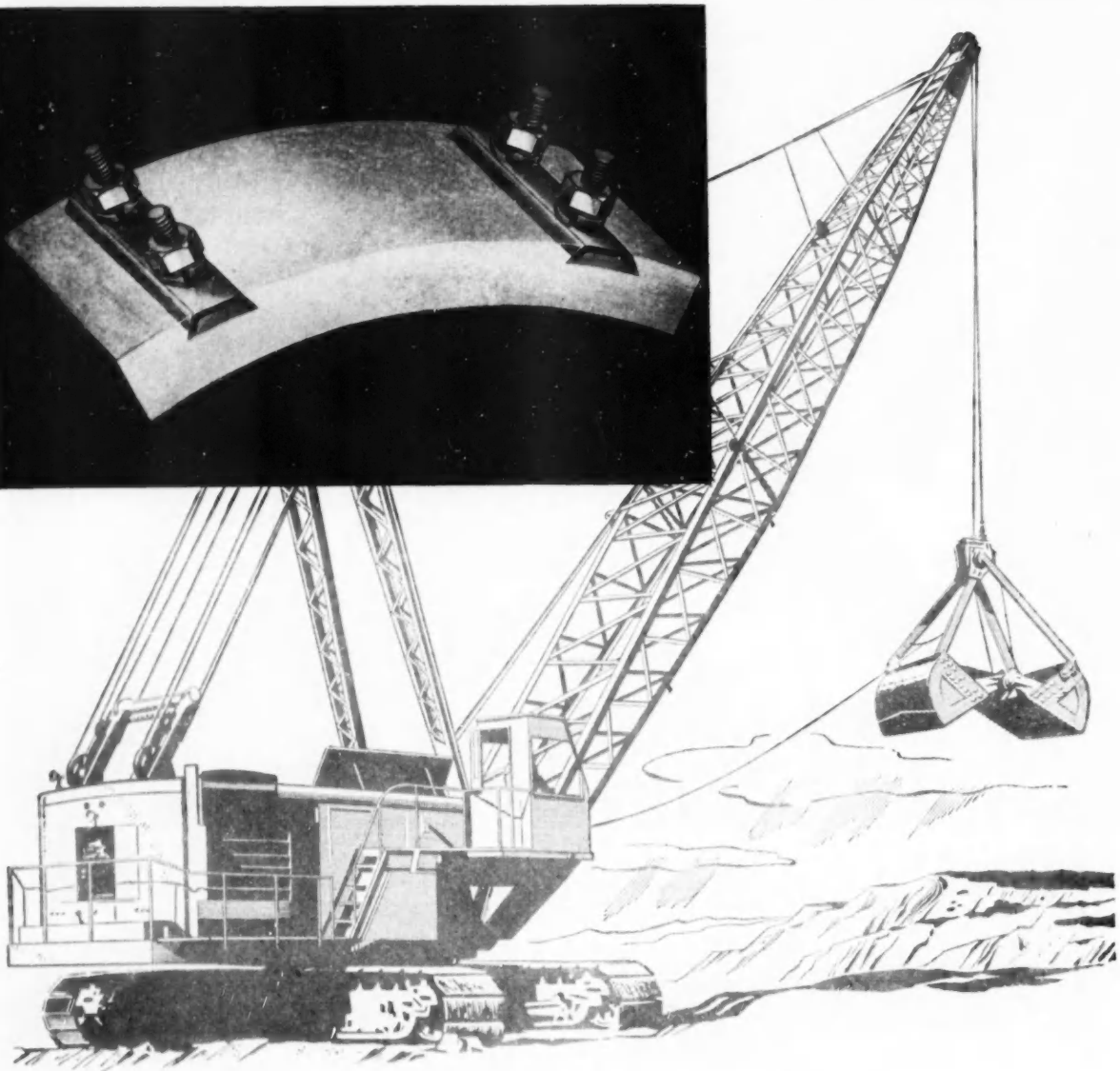
ALUMINUM PERMANENT MOLD AND SAND CASTINGS . . . HARDENED, GROUND AND FORGED STEEL PARTS

R/M
FIRST IN FRICTION



Tiptoe control and positive braking power are features of this 5 cubic yard clamshell, powered by a 350 hp diesel engine. The 10″ clutch and brake blocks on the 52″ diameter drum are R/M Type 3000 Blocks mounted on R/M Key-Lok slides. Key-Lok device makes it possible to replace friction parts without removing band and without special tools. Machine is quickly converted for use as dragline or crane.

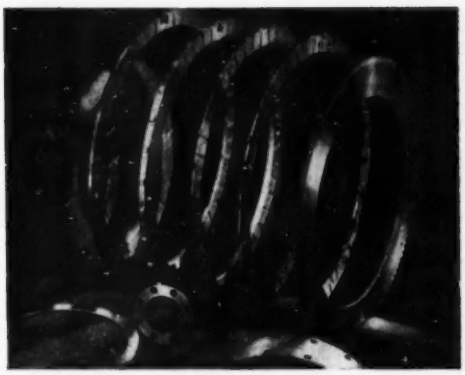
THE TRADE-MARK THAT SPELLS PROGRESS IN FRICTION MATERIAL DEVELOPMENT!

To meet growing needs, manufacturers of earth-moving equipment are constantly increasing power and capacity. In turn, this requires consistent advances in friction material . . . advances consistently *achieved* by Raybestos-Manhattan!

In other fields, in other industries, the story is the same. Increases in power and capacity call for more efficient, more effective control elements . . . and R/M meets the call. The automotive industry itself is an apt example. So are the office equipment industry, the mining machinery industry, and many others.

Different *types* of friction material, in numerous combinations, are used by R/M to provide desired results. Woven and molded asbestos, semimetallic materials, and sintered metal parts are all in the picture.

No matter what your "Stop-and-Go" problem, you'll find your R/M representative ready to help. Behind him stand all the facilities of the world's largest maker of friction materials . . . with six great plants, their research departments, and their testing laboratories.



Demand for sintered metal parts *continues to grow, and R/M continues to increase capacity for this type of friction material. Sintered metal is exceptionally suitable for applications requiring close tolerances, or for operating conditions such as immersion in oil.*

The R/M Engineering Bulletin illustrates examples of R/M friction materials for aviation, agricultural, automotive and other industries. Write for your copy.

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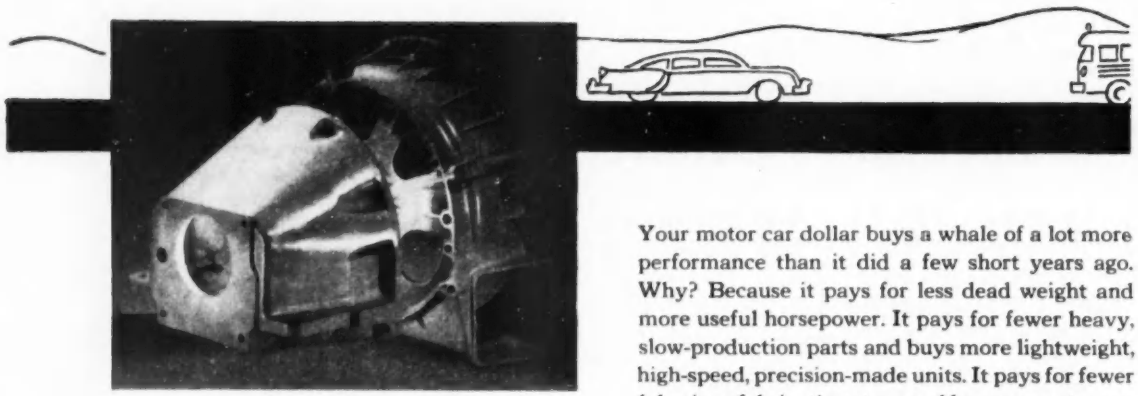
RAYBESTOS-MANHATTAN, INC., Manufacturers of Brake Linings • Brake Blocks • Clutch Facings Fan Belts • Radiator Hose • Industrial Rubber Products • Rubber Covered Equipment • Packings • Teflon Products • Asbestos Textiles • Sintered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

R M

FIRST IN FRICTION

How Doehler-Jarvis

halve the weight and

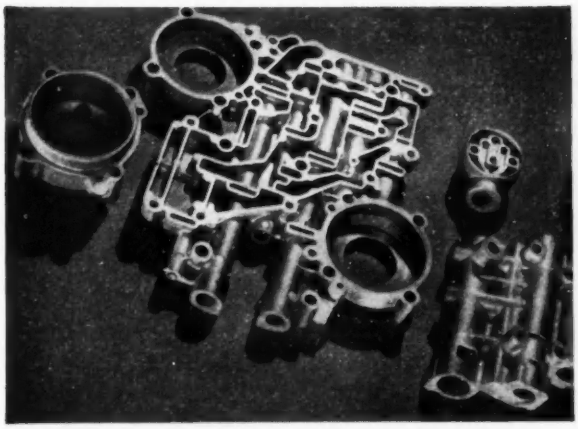


These torque converter and clutch housings are light, sound and strong. They withstand great vibrational stresses and the jarring and jouncing encountered in endless miles of "shift-free" motoring. As cast by Doehler-Jarvis, these housings provide many economies in machining costs. For one example, the long oil holes in the torque converter housing are cast-in.

Your motor car dollar buys a whale of a lot more performance than it did a few short years ago. Why? Because it pays for less dead weight and more useful horsepower. It pays for fewer heavy, slow-production parts and buys more lightweight, high-speed, precision-made units. It pays for fewer laborious fabrication steps and buys more streamlined assemblies of formed-to-fit parts.

As a case in point, consider the automatic transmission. It has become progressively more efficient, lighter in weight, part for part – and less expensive to own and operate.

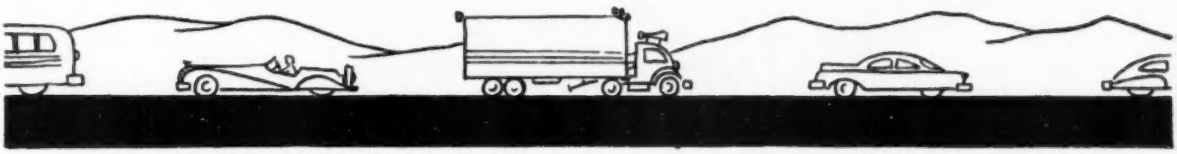
These improvements have been made possible to a great extent by the use of die cast parts, many of which are produced by Doehler-Jarvis in close cooperation with motor car makers.



Valve castings used in an automatic transmission. These parts are among the most intricate of the multitude of die castings made by Doehler-Jarvis. Obviously extreme dimensional accuracy is required for proper fit and functioning of all valve components.

Helped Motor Car Makers

lower the cost of heavy duty housings



A prime example of this teamwork between the customer's design and engineering staffs and those of Doehler-Jarvis is the set of housings – torque converter and clutch – illustrated.

These are truly heavy duty parts. Before Doehler-Jarvis entered the picture they weighed together about 50 pounds and required considerable working-over and machining prior to assembly. The Doehler-Jarvis aluminum housings weigh about 23 pounds and require a minimum of handling before assembly.

This is but one example of how the Doehler-Jarvis organization, with resources and resourcefulness developed during a half century of die casting, works hand-in-hand with makers of metal products – in the automotive, household appliance, office machine, electrical merchandise and many other important industries.

Call in Doehler-Jarvis when you are faced with problems in the design and procurement of lighter weight, lower cost, more efficient metal parts.

Doehler-Jarvis Division
of
National Lead Company
General Offices: Toledo 1, Ohio

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LP GAS HOSE NO. 101
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Scientific tests were conducted by Underwriters' Laboratories to determine "the strength and durability of the hose, and resistance of the tube to action of the liquefied propane and butane to which it will be subjected in service." Aeroquip 1533-type Hose met every requirement and was the first L.P.G. Hose authorized to carry the Underwriters' Laboratories label.

AEROQUIP HOSE AND FITTINGS ARE MATCHED FOR GUARANTEED PERFORMANCE

Now you can take advantage of the cost-cutting, time-saving features of Aeroquip Hose for L.P.G. applications. Now you can make hose lines as needed by cutting bulk hose to required length and attaching the reusable fittings. It's quick, easy and it simplifies inventory problems. U.L. listed Aeroquip 1533-type hose is recommended for use on engines and other "fixed" installations. It is exceptionally light, flexible, and strong. A braided wire reinforcing layer within the hose provides hundreds of points of contact with the hose fitting thus assuring safe conductivity of static electricity. Also available is Aeroquip 1536-type hose which is rubber covered to resist the effects of abrasion in bulk handling applications. 1536-type hose is now being tested by U.L.

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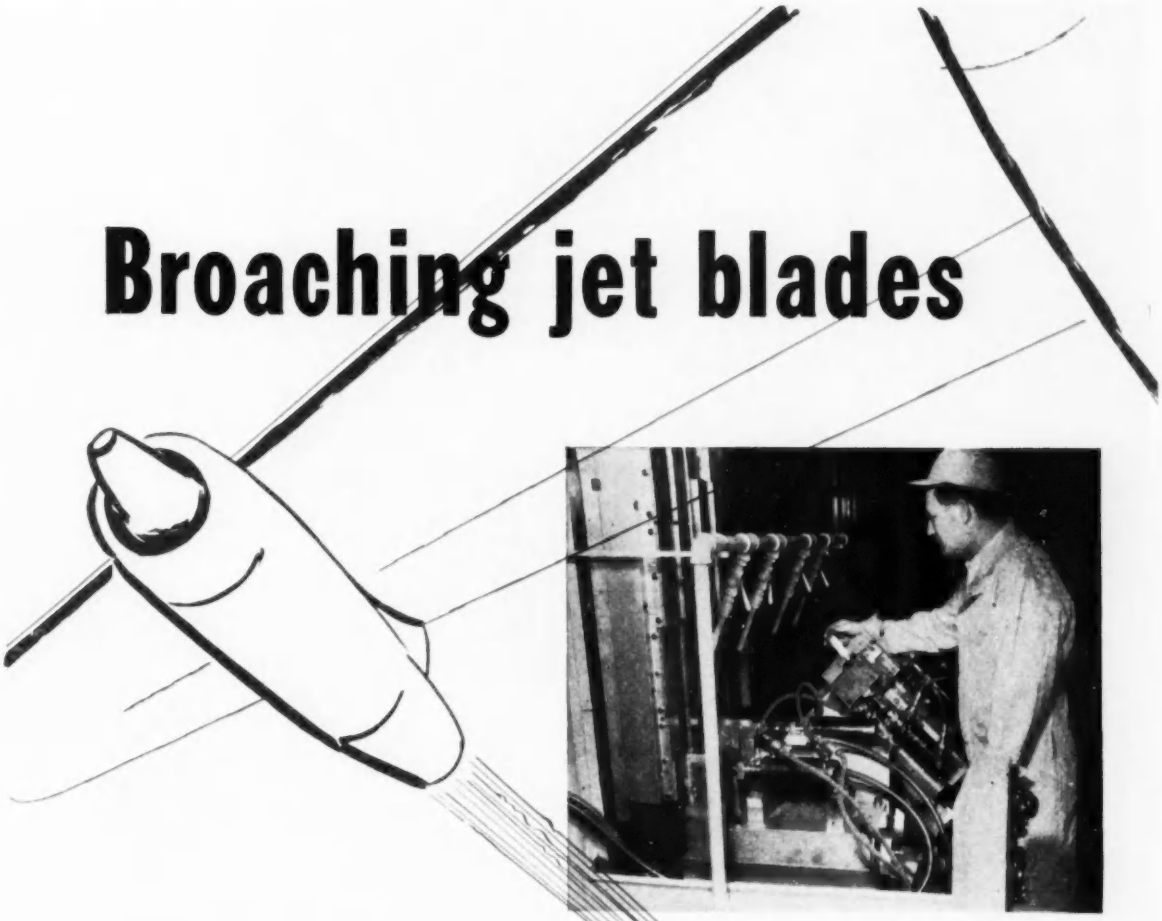
SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA. MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA

AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

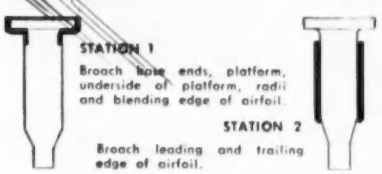
Broaching jet blades



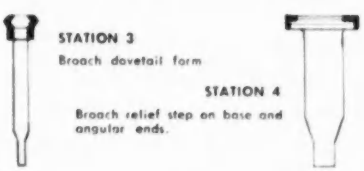
American Dual Ram Surface Broaching Machine performs 4 operations on stainless steel blades

To broach stainless steel jet compressor blades, American installed standard vertical hydraulic dual-ram surface broaching machines with tilting work tables. Each machine was arranged with 4 broaching stations, two at each ram. One of each of the operations shown are performed at each of the 4 stations. The parts are automatically clamped and unclamped with the operator loading the stations at one ram while the other is broaching.

For answers to your broaching problems write to American — the company that makes all three — machines, fixtures and broaches.


STATION 1
Broach base ends, platform, underside of platform, radii and blending edge of airfoil.
STATION 2
Broach leading and trailing edge of airfoil.

HERE ARE THE FOUR JET BLADE SURFACES BROACHED



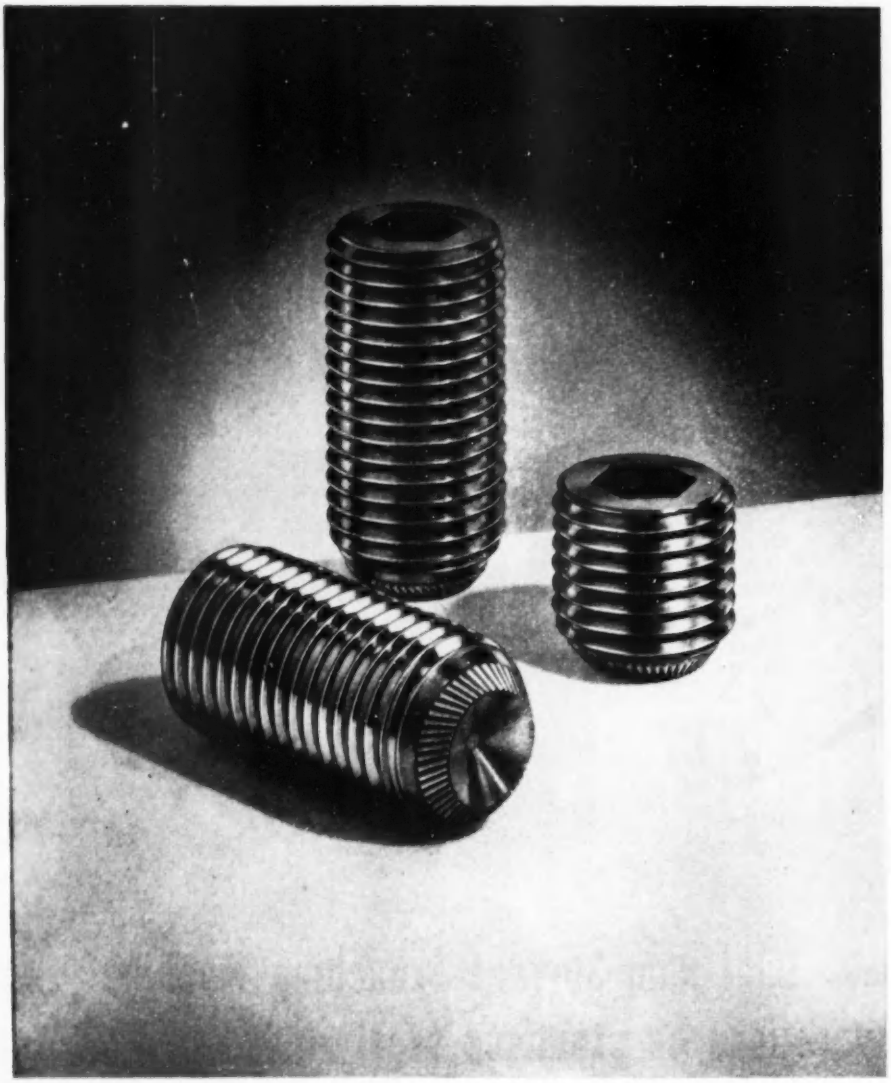
Catalog #300 illustrates and describes American surface broaching machines. Send for a copy for your files.

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

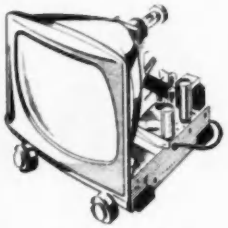
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.

Our Fifteenth Year

A START FOR THE FUTURE



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets, electronic equipment.

On refrigerators, washing machines, and other household appliances.

On power mowers, power saws and other power tools.

9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for UNBRAKO Standards. SPS, Jenkintown 53, Pa.

Write for UNBRAKO Standards

UNBRAKO® SOCKET SCREW DIVISION

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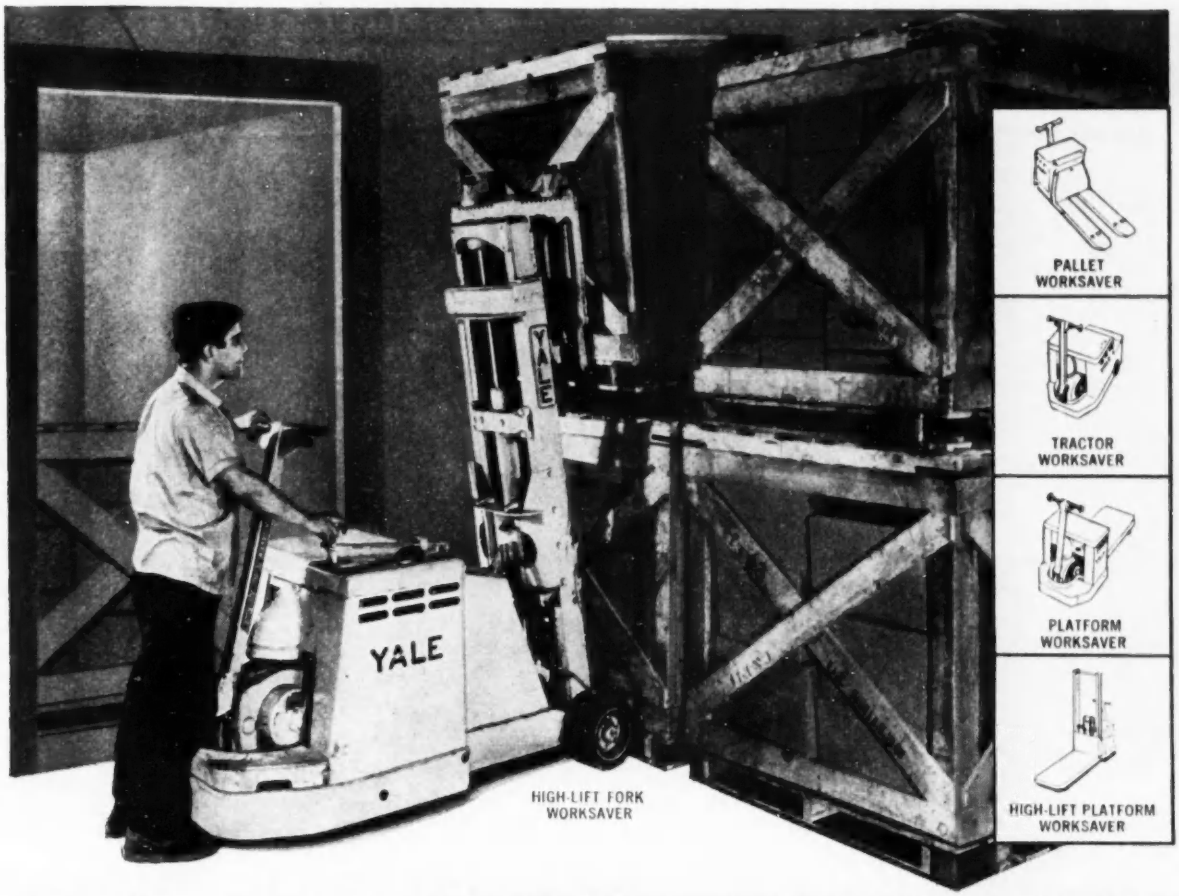
JENKINTOWN PENNSYLVANIA



YALE *WORKSAVERS*

give big truck power ...where big trucks can't go

Where size and weight rule out big trucks, YALE WORKSAVER ELECTRIC TRUCKS take over. Yes, YALE WORKSAVERS save industry time, manpower and money where low-load capacity flooring, unreinforced elevators and ramps had previously restricted materials handling operations to back-breaking manual moving, lifting and stacking.

YALE WORKSAVERS give big truck advantages...big truck versatility...at small truck cost! Features include forward and reverse power travel—hydraulic lift—complete range of use-extending attachments. Contact your local Yale Representative for a demonstration of the WORKSAVER line in your own plant...at your own time.

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MATERIALS HANDLING EQUIPMENT

**Registered in U. S. Patent Office*

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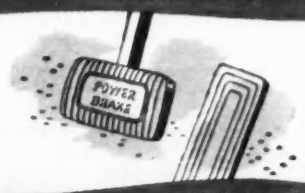
Gas, Electric, Diesel Lift Trucks • *Worksavers* • Hand Trucks • Hand and Electric Hoists • Pul-Lifts

Bendix the only performance PROVEN Low Pedal Power Brake



Now a PROVEN sales producer for leading car manufacturers

Specified by More Car Manufacturers Than Any Other Make

The car buying public has been quick to recognize that the Bendix* Low Pedal Power Brake is not only a most desirable new car feature, but that its effortless, quick and positive braking actually is a revolutionary advancement in motor car control. Thus, the car manufacturer offering his customers this advanced feature has a decided advantage over competition.

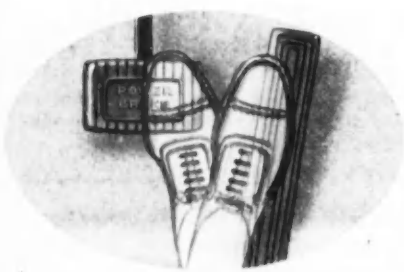
That this is an established fact and not a theory is unmistakably proven by the ever increasing percent of car buyers specifying the Bendix Low Pedal Power Brake on cars offering it as optional equipment . . . tangible evidence that the Bendix Low Pedal Power Brake is one of the most popular devices offered the public in years.

This greatest improvement in braking since four wheel brakes is unique in many ways. It is, for example, the only low pedal power brake that has met the test of millions of miles under all operating conditions. In fact, Bendix Low Pedal Power Brake is specified by more manufacturers than any other make. Remember, too, this new low pedal power brake is the product of Bendix—world's largest producer of power brakes and leader in braking developments since the earliest days of the industry.

For any car manufacturer interested in adding a big plus to his sales story, the Bendix Low Pedal Power Brake is the answer.

*REG. U.S. PAT. OFF.

NOW *Stopping* IS AS EASY AS *accelerating*



It is no longer necessary to lift the foot and exert leg power pressure to bring your car to a stop. With the Bendix Low Pedal Power Brake on about the same level as the accelerator, an easy ankle movement, much like working the accelerator, is all the physical effort required for braking. And by merely pivoting the foot on the heel, shifts from "go" to "stop" controls are made in far less time.

Result! MORE DRIVING COMFORT, LESS FATIGUE AND GREATER SAFETY

Bendix Products Division

BENDIX PRODUCTS DIVISION SOUTH BEND

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High Spots of This Issue

★ Automatic Controls for Surface Finishing Jet Engine Parts

Every phase of jet engine part production demands careful supervision and diligent attention to the processes involved. This article relates how Studebaker Corp. employs automatic controls for surface finishing procedures. See Page 48.

★ Solving Automotive Problems With Automatic Computers

That heaven-sent panacea for simplifying the intricate problems of modern technology, the computing machine, is finding widespread popularity in the automotive industries. Its various aspects and applications are reviewed here. Page 52.

★ Mass Production Techniques Applied to Building Bus Bodies

Superior Coach Corp. recently completed its 30th year of building school buses, ambulances, and funeral cars. Although its volume of output never reaches that of a car maker, it has, nonetheless, found some Detroit techniques useful. Page 58.

★ Advanced Methods for Making Steel Piston Rings

The Diesel Equipment Div. of General Motors Corp. has climbed still another rung upward in its expanding production ladder with its current output of piston rings for "71" engines. The author reviews here the advanced methods used. Page 64.

★ Cutting Abrasive Costs in Body Plants

Popular as they are, especially for body assembly operations, coated abrasives do take a substantial slice out of plant budgets. Suggested in this article are various measures helpful in reducing costs of these production aids. Page 66.

★ 35 New Product Items And Other High Spots, Such As:

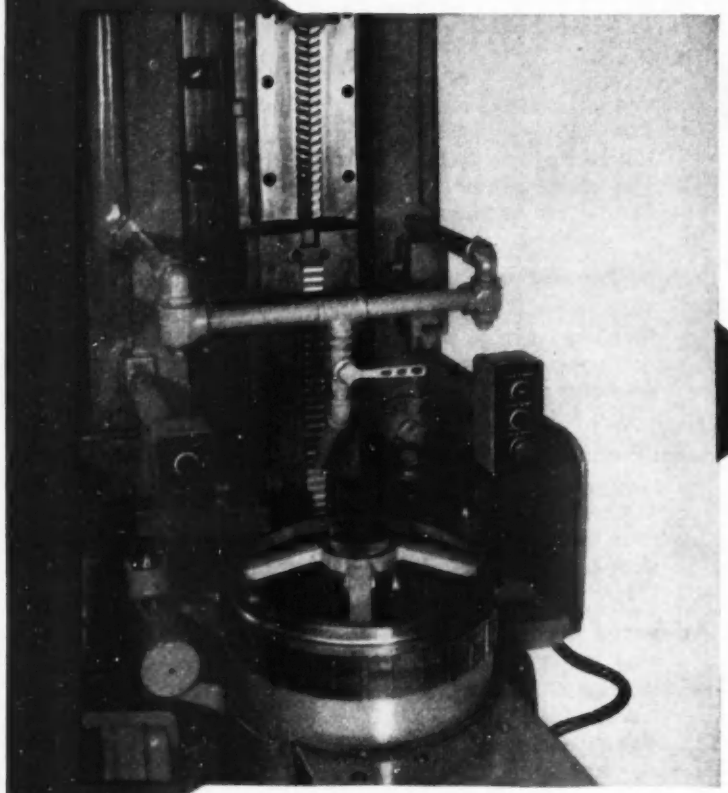
Production rate of turning crankshafts increased seven times; design characteristics of fully automatic transmission for fork-lift industrial truck; Caterpillar develops oil-type tractor clutch; Diamond T tilt cab requires no power for operation; and forming exhaust pipes with timesaving equipment.

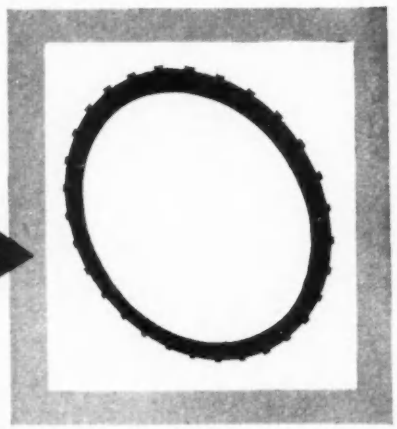
Automotive and Aviation News, Page 33
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES
BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT
SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

Automatic Hydro-Broach Setup

cuts 30 teeth in stack of Clutch Rings

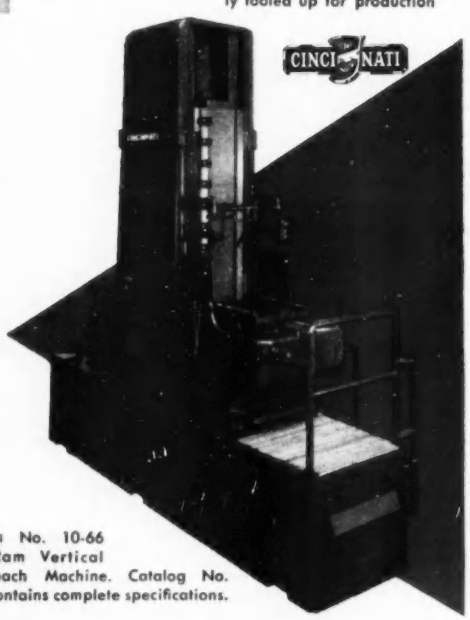




Clutch ring broached on the Cincinnati equipment illustrated here. Production data:

Part Name ..... clutch ring
Material ..... steel
Stock Removal ... from solid
Production ..... 95 per hour (estimated)
Machine ..... CINCINNATI No. 5-54 Single Ram Vertical Hydro-Broach completely tooled up for production

It's easy to see why one component of a defense item is grouped in the low-cost classification. The CINCINNATI Hydro-Broach illustrated here, tooled up with an automatic fixture by Cincinnati Application Engineers, cuts 30 teeth in 16¾" diameter clutch rings for tanks at a rapid rate of production. ¶ Fourteen parts are stacked and clamped in the fixture. Then the operator starts the cycle and it repeats automatically until the entire ring is broached. Cycle elements: advance table; rough and finish broach in one stroke; recede table, index, and return ram to top of stroke; repeat 29 times. Two clamps near the tooth being broached are automatically released during the indexing element of the cycle. ¶ Hydro-Broach advantages for low-cost production include hardened and ground table and ram ways... automatic pressure lubrication, with manual flushing control... Pre-Set Cycle Control for operator's safety... interchangeable broach holders. These are a few of the Cincinnati advantages which you should consider in selecting more efficient shop equipment. Catalog No. M-1745 gives you a more complete picture. May we send you a copy?



CINCINNATI No. 10-66 Single Ram Vertical Hydro-Broach Machine. Catalog No. M-1745 contains complete specifications.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 109, No. 5 September 1, 1953

Cadillac Tells Details of Experimental Car

Further details of its plastic-bodied LeMans experimental car were revealed by Cadillac following a press showing at the GM proving ground in August. It is powered by a modified Cadillac V-8 engine which delivers 250 hp with a 9 to 1 compression ratio. Included among the modifications are two four-barrel carburetors, redesigned manifolds, high-lift valves, and two special air cleaners and mufflers. The Hydra-Matic transmission has been adapted to the higher engine performance.

Overall height is 51 in. to the top of the windshield, 7.9 in. lower than the standard Cadillac convertible; overall length is 198.1 in., also shorter than the standard Cadillac and weight is 4485 lb, 324 lb lighter than the standard car. Other specifications include wheelbase 115 in., overall width 80.6 in., dual exhaust, and 258.4 sq in. of braking area. Wheels are of chrome bladed construction to give added brake cooling, headlight shells are formed by extension of the front fender, and a full width instrument panel, including a tachometer and Hydra-Matic indicator. Cadillac has no plans at the moment to produce the car as a production item.

New Model Changes to be Extensive

With new model announcement time coming up in the next two or three months for some makes, car manufacturers are carefully guarding new developments because of effects of premature announcements on retail sales. However, in general it now looks as though changes will be quite far reaching for some companies and even those with so-called face lifting due next year will go considerably further than they have previously on their "off-year" changes.

CONVERTIPLANE TEST BED

This is how a Kellett autogiro will look when it is converted to investigate a partially loaded rotor system for the Navy. The 1939 model once used by Eastern Airlines will have Lycoming 140-hp engines added on each wing as shown, in addition to the 275-hp Jacobs engine. Total weight will be about 3400 lb, according to the Navy.

In general, horsepowers are likely to again surge upward, with a top of 235 entirely possible. There will be some completely new bodies and rather extensive changes on some existing ones. Certainly the stiffening retail market is influencing the extent of some changes and where major body dies could not economically be altered for next year, more than usual latitude is being taken with fenders, grilles, and other components. One of the major trends in new styling will be toward lower roof lines.

Another trend that will be noticed in next year's models will be addition of more elaborate deluxe lines, similar to the tack taken by Chevrolet with its Bel Air this year.

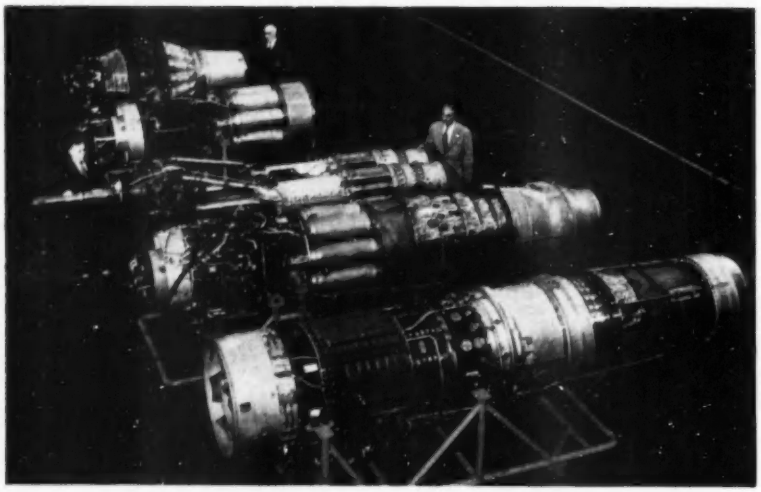
Truck Prices Adjusted

Ford trucks now have certain freight charges added to list prices, a practice which was suspended by OPS when that agency was active. To compensate for the increased freight costs, prices in three of the company's 21 series—the panel delivery, F-100 and F-350 series—which account for at least 60 per cent of the company's sales, were reduced so that net effect is very little change in the price paid by the customer. Prices in other series are increased by the amount of the added freight charges.

Military Using More Commercial Trucks

Under its new policy the military establishment is turning more and more to commercial type vehicles for use wherever they are practical because they are lower in cost and cheaper to maintain and operate than special military trucks. GMC Truck and Coach has just completed a $3.74 million order for the Navy consisting of almost 1400 regular commercial models. Stake, dump, van and tractor models were included in the order.

News of the AUTOMOTIVE



ALLISON'S GAS TURBINE FAMILY

Five types of turbojet and turboprop engines are now in production by Allison Div. in Indianapolis. Together they have over three million hours flying time. Front to back they are J-71 turbojet, most powerful production engine in this country; J-35 axial-flow with afterburner for the Northrop F-89; T-40 turboprop for the Douglas A2D and Convair R3Y; J-35-A-29 for Republic's F-84G; and J-33 for the Lockheed T-33 trainer and Grumman F9F-7.

Used Car Market Shows Uptrend

Despite a great deal of moaning in several quarters about the serious problem in used cars, there seems to be little statistical evidence to support the pessimism. Several automobile companies report that dealers are moving used cars at a satisfactory pace and the National Used Car Dealers Association reports that during June demand picked up, reversing a five-months sales decline. It also is evident that both new and used car dealers have adjusted their thinking about used cars and that the market is reverting to about the same depreciation rate that existed prewar. General Motors calculations indicate that depreciation today actually is a little greater, percentage wise, than it was in 1940 when it averaged about two per cent a month, or about $50 a month on price levels prevailing then. Following the war and up through 1948, automobiles suffered little or no depreciation during the first year because of the shortage. Beginning with 1949 and until late 1952, however, the rate of depreciation crept upward to about 1¾ per cent per month. On current models it is running about 2.4 per cent but this is expected to level off closer to the prewar rate.

Diesel Tractor to be Imported

Ford Tractor Div. will import for sale in the U. S. the Fordson Major Diesel farm tractor manufactured by Ford Motor Co., Ltd., of England. First quantity shipment of the Fordsons is expected in mid-September at New Orleans, La. Initial introduction will be limited to ten southwest and western states where Diesel tractors are most popular. An estimated $3 million worth will be imported this year.

Weighing approximately 5000 lb the Fordson Diesel has six forward and two reverse speeds. Hydraulically-controlled three-point linkage and a vertically adjustable swinging drawbar permit the tractor to be operated with a wide variety of implements, both mounted and pull-type. A spokesman said the retail price of the Fordson Diesel will be considerably lower than most comparable Diesel-powered tractors now available.

June New Car Sales Hits 30 Month Peak

New passenger car registrations during June continued the month by month gain exhibited all during this year to hit 542,193 units, the highest monthly total since December 1950. According to R. L. Polk & Co., June registrations exceeded the previous month by approximately 2000 units and brought the total of new passenger car registrations for the first half of this year to 2,880,193 units. New truck registrations, on the other hand, dropped 9000 during June, totalling 77,199 units to bring first half registrations to 475,484 compared with 389,932 for the first half of last year. Contrary to passenger car registrations, new truck sales have been trending downward in the two latest months tabulated, with May 6000 lower than April.

Ford Decentralizes Highland Park Unit

Continuing its decentralization program which has been in effect for the past two or three years, Ford Div. announced formation of five new product groups at the Highland Park plant. Under the reorganization, manufacturing activities are split into the Detroit truck plant to be headed by Frank E. Wilde, Ford tractor plant under W. G. Nelson, rocket and parts machining plant under N. F. Kroll, trim plant to be managed by C. F. Hancock, and paint and artificial leather plant with C. L. Wallace as manager. M. L. Wiesmyer, general manufacturing manager, also has appointed L. E. Krieg as planning manager and D. D. Cooper plant services manager for the Highland Park manufacturing area. The plant covers 169 acres, with 59 buildings containing more than 4.1 million sq ft of floor space. Currently about 9000 persons are employed there.

New Caterpillar Unit

Creation of the Engine Div., a new major component of the company, has been announced by Caterpillar Tractor Co. The new organization is said to be an outgrowth of a need to meet customer requirements.

AND AVIATION INDUSTRIES

Rapid Improvising Marks General Motors Efforts After Fire

Switch to Torque Converters, Subcontracting of Hydra-Matic Parts Could Save the Industry Drive for a Production Record

All the resources of the General Motors Corp. are behind the drive to get Cadillac, Oldsmobile and Pontiac Divisions back in production with automatic transmissions by as early as the middle of next week.

Full effects of the disastrous fire which completely razed the huge, nearly new, ultra modern General Motor Hydra-Matic transmission plant at Livonia, Mich., Aug. 12 will not be known for several weeks. The fire caused damage estimated at over $40 million and was undoubtedly the most costly in the history of the industry.

General Motors, with its characteristic vigor and decisiveness, moved in to assay the damage to the tooling while the ruins were still smoking to determine how many of the 6000 machines, valued at about $10 million, in the plant could be salvaged. Early salvage operations indicated that damage to equipment was not as bad as was feared at first. It is reported that of the first one thousand machines removed from the plant about 80 per cent could be salvaged. A high per cent of the damage appeared to be to electric motors.

Switch to Dynaflow, Powerglide

Cadillac and Oldsmobile will use Dynaflow and Pontiac will adopt Powerglide as emergency measures to keep production going, perhaps by Sept. 8. All three divisions have run tests to determine whether the alternate automatic transmission will operate satisfactorily in their particular car. There is no indication yet whether Cadillacs and Oldsmobiles equipped with Dynaflow will carry an extra price premium. On Buick, Dynaflow as optional equipment lists at $192.50; Hydra-Matic on Oldsmobile carries a price of $178.35 as optional equipment.

Of the makers who buy Hydra-Matic transmissions, all but Lincoln were out of production at the time of the fire and consequently would feel no immediate effects until after they resume production, probably in September. Lincoln is curtailing production to stretch out its supplies for several weeks. Also affected to a lesser degree is the GMC Truck & Coach Div., which uses Hydra-Matic in its light models and also in the military truck.

Manufacture of components will be farmed out to the various divisions and to suppliers. Even while salvage operations were still going on, some 2000 "visitors" in one day swarmed over the area, pouring over blueprints to see what parts their particular plant might make.

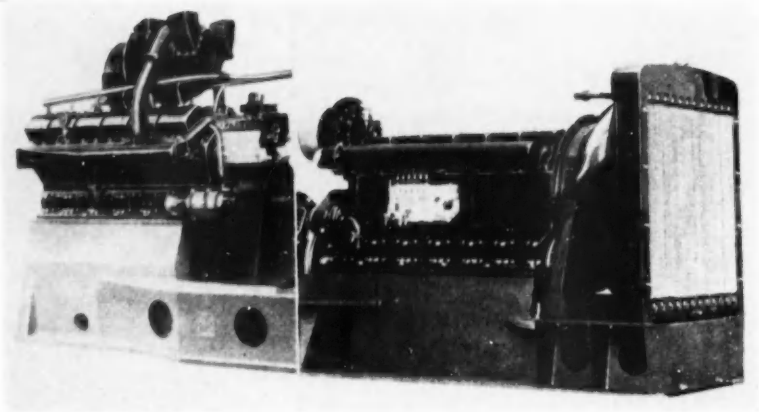
To fill the breech, GM announced, it negotiated a deal with Kaiser Motors for use of the Willow Run plant for production of Hydra-Matic transmissions. GM will use about 1.5 million sq ft of floor space formerly used by Kaiser for aircraft production which now is just winding up. The Air Force is cooperating by speeding removal of equipment. GM could give no estimate, however, for the time required to get back into production.

Will Rebuild Livonia

General Motors will build a new plant on the same site at Livonia and will require thousands of machine tools, jigs and fixtures, conveyors, and other equipment to re-establish its operations there. The plant had 1.5 million sq ft of floor space, of which part was occupied by Ternstedt Div. on a military project. It is assumed that the new plant would encompass about the same area.

Whether or not the fire will affect the industry's chances to attain the near record production previously envisioned still is unknown. Also uncertain is whether or not it will delay new model introductions for the passenger car divisions involved. Observers were optimistic that non-GM Hydra-Matic buyers would improvise with torque converters.

News of the AUTOMOTIVE



LIGHT DIESELS FOR HEAVY DUTY

Two new heavy-duty Diesel engines are in production by Mercedes-Benz and licensed to Fiat as well. The six and 12-cyl engines have a 6.89 by 8.07 in. bore and stroke, for displacements of 1806 and 3612 cu in. Output is 330 and 660 hp at 1500 rpm, or 500 and 1000 hp with an exhaust driven blower. Light alloy cylinder casting, crankcase, and oil sump are used, with wet liners. Overhead valves are pushrod operated. Weight of the supercharged 12 is 6063 lb, of the unblown model 5400 lb.

Defense Plants Plan Idle Tool Storage

Studebaker will complete output of 2-½-ton military trucks soon and will store about $1.3 million in government tools at its South Bend plant under a rental arrangement with the Ordnance Corps. Studebaker also will lease about $200,000 worth of tools largely painting equipment for civilian production.

Under the new tool storage program involving an estimated $615 million worth of government tools and machinery, negotiations also are under way with other contractors for storage of tools when defense work is completed. These include the General Motors Buick plant at Flint, currently using about $25 million in government tools for tank transmissions; the Chrysler-operated government plant at Michoud, La., using $58 million in government tools for tank engines; the Chrysler Detroit tank plant, operated by Chrysler, with $30 million in government tools, and Lycoming-Spencer Div. of Avco with $8.25 million of government tools used for tank engines.

Pan-Am Road Race

The Fourth Annual Pan-American Road Race through Mexico is scheduled for Nov. 19-23. The same 1934-mile course as used last year is planned from the southern border of Mexico to Juarez, across the line from El Paso, Texas.

Four categories of entries will be established this year instead of the two in last year's race: international standard class, production cars of 1950-1953; international sports class; special sport car class, up to 1600cc capacity, or 800cc if supercharged; and special smaller standard car class, up through the six-cyl Dodge and eight-cyl Pontiac.

Union Wins Vesting of Pension Credits

UAW-CIO has attained another of its objectives in pension plan goals in an agreement with Udylite Corp. and its Parker-Wolverine Div. The pension plan, in addition to the usual provisions, also provides vested pension rights after ten years of service. Under the agreement a worker leaving the company after ten years of service retain pension rights and credits. The agreement also differs from others in that it provides for no compulsory retirement at any age, in contrast with most agreements which require compulsory retirement at age 68.

Air Conditioner Firms May Invade Auto Field

Success of air conditioning of passenger cars may lead to invasion of the field by manufacturers of air-conditioning equipment with a car cooling accessory unit. An old line air-conditioning firm is reported to be developing an automotive air-conditioner similar in size and cost to the conventional car heater. The unit is said to operate on a "revolutionary" principle and will sell for less than present systems. There also is some speculation within the automotive industry that ultimate development will produce a combination heating and cooling unit at far below the combined cost of two separate installations.

Dealers Study Parking

Hudson dealers, in cooperation with Hudson Motor Car Co., have organized a national parking study council to attack the parking problem. The organization has engaged consultants and a research staff to gather information in communities which have dealt successfully with the parking problem. The material is to be presented to government and business leaders and to community agencies.

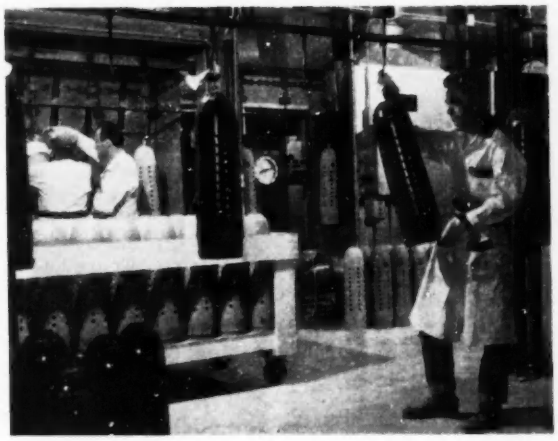
Delta Transport Ready

The new British Avro Atlantic, civil version of the delta-winged Vulcan bomber, needs only orders to go into production, and could be in service by 1958, the company said recently. It will have a maximum range of over 5000 miles, and an operating range of up to 4000 miles. Cruising speed will be above 600 mph, and passenger-capacity will be between 90 and 120. The spokesman said that the Atlantic could be flying within three years of the first order being placed. Two years later delivery to the air lines could begin.

Demonstrate Blower

Top executives of McCulloch Motors Corp., Los Angeles, visited Detroit recently to demonstrate performance of the new McCulloch variable-speed-drive, centrifugal supercharger. The group brought a caravan of seven supercharged automobiles of different Detroit makes.

AND AVIATION INDUSTRIES



MASS COATINGS

High - temp ceramic coatings are applied to alloy steel jet parts up to 10,000 pieces per month at Solar Aircraft plant. The Solaramic process cycle time from receipt of parts to packing for shipping is one hour.

Ford Assembly Plant to be Built in N. J.

An agreement to purchase a 177-acre site at Mahwah, N. J., for the construction of the Ford Division's biggest assembly plant has been signed by Ford Motor Co.

The company plans to complete the plant and begin the assembly of Ford cars and trucks in about two years. It will have more than 1.5 million sq ft of manufacturing space and will be designed for two-shift operations.

Irving Babcock Heads Dearborn Motors

A veteran automotive executive has returned to the industry as president of Dearborn Motors Corp. and Dearborn Motors Credit Corp. He is Irving B. Babcock, long known in the industry for his position with Yellow Manufacturing Acceptance Corp., Yellow Truck and Coach Manufacturing Co., vice-president of General Motors and general manager of GMC Truck and Coach Div., and the Aviation Corp. Since 1948 he has been associated with Peninsular Grinding Wheel Co., Crosley Broadcasting Co., and Motors Metal Manufacturing Co.

Boxcars in New Home

Fairchild Aircraft has now moved its C-119 Flying Boxcar production into new manufacturing facilities and is putting the finishing touches on buildings erected under its recent $9 million plant expansion program.

Largest of the newly completed facilities is a production bay 765 ft long and 200 ft wide which adds 153,000 sq ft of unobstructed floor space for final assembly. This adjoins the main production line where Fairchild has been building C-82 and C-119 transports for nearly eight years.

Fairchild Aircraft boosted personnel from a pre-Korea level of less than 5000 to 6000 by the Fall of 1951 when ground was broken for the first of the new buildings. By early this year, employment was over 9000.

Aerial Target to Have Fairchild Jet Engines

Jet engines of advanced design made by the Engine Div. of Fairchild Engine and Airplane Corp. will be installed in high-speed aerial targets for use by Army Ordnance to aid in training Army troops in the operation of the Skysweeper gun and various guided missiles. Ryan Aeronautical Co. is to manufacture the complete target.

The Fairchild J-44 engine will be the sole source of power for the targets a second or two after they are ground-launched from a platform, with the aid of an initial rocket thrust to attain flying speed. Officially designated the XM21, the new air target has swept-back mid wings and tail surfaces and is approximately 12 ft wide and 18 ft long.

Chevrolet Operations to Open in Tonawanda

Next spring or early summer has been set as the target date for the beginning of two new Chevrolet industrial operations in Tonawanda, N. Y., that will provide employment for more than 3000 persons. Four huge new plants for a forge and a foundry are well under construction as part of Chevrolet's $30 million expansion in the town.

Buick Engine Plant Tooling Completed

Buick has completed tooling its new modern engine plant at Flint and now is producing more than 1200 V-8 engines a day. Buick initially had to improvise part of its tooling because special machinery was delayed. The division expects to turn out 525,000 cars this year, very close to the record 550,000 units produced in 1950.

Three Ford Parts Depots Scheduled to Open Soon

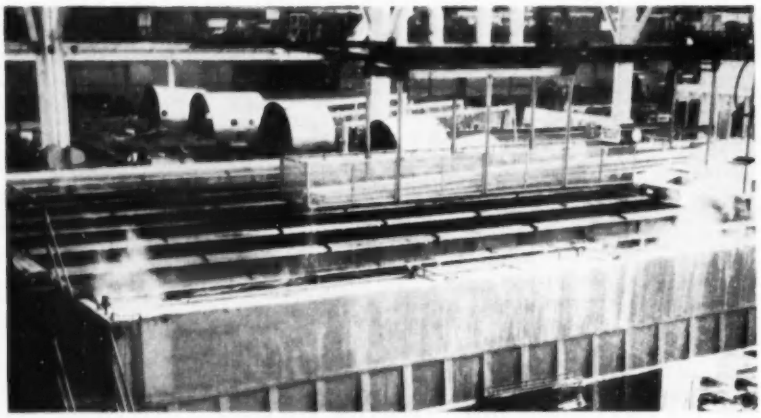
Three new Ford Div. parts depots in a nation-wide network will be completed and put into operation during the next few months to serve 1100 dealerships in the East and Midwest.

Plants are scheduled to be put into operation at Teterboro, N. J., for the New York area, at Pittsburgh, and at Chicago, making 17 such new facilities built since World War II. The new plants will total about 675,000 sq ft of floor space which will be occupied by parts supply and distribution facilities and by depot and sales personnel for the three localities.

Dow Chemical Dedicates Texas Research Center

Dedication of a new $2.6 million research center at the Texas Div. of Dow Chemical Co. has been anounced. In its 69,000 sq ft of space, the center will house the division's organic, chemical engineering, and electrochemical research as well as the analytical laboratory. It will also include research administrative offices, a patent office, and a library.

News of the AUTOMOTIVE



LARGEST ALUMINUM CLEANER

The largest airframe part built can be dunked in this chromodize-iridite facility at Lockheed. The chemical cleaning process is said to be faster and to provide a better paint base than does electrolysis. Iridite can be applied to dissimilar metals, requires no special racks and procedures, cuts maintenance and speeds work flow. The nine tanks in the process hold 18,000 gallons each, are 52 ft long.

Traffic Death Toll Up

Traffic fatalities for the first half of this year in actual numbers was three per cent ahead of the same period a year ago, totaling 17,300 according to the National Safety Council. On the basis of vehicle miles traveled, however, the figure is slightly better this year, totalling 6.6 fatalities for 100 million miles compared with 6.7 for the first half of 1952.

1953 NEW PASSENGER CAR REGISTRATIONS*

Arranged by Makes in Descending Order According to the 1953 Six Months' Totals

MAKE	June 1953	May 1953	June 1952	SIX MONTHS Units 1953	SIX MONTHS Units 1952	SIX MONTHS Per Cent of Total 1953	SIX MONTHS Per Cent of Total 1952
Chevrolet	137,390	129,764	85,052	670,082	446,136	23.27	20.85
Ford	72,500	90,112	68,012	475,500	354,847	16.51	16.58
Plymouth	58,405	54,207	46,988	302,389	235,355	10.50	11.00
Buick	47,526	43,549	30,474	236,744	161,469	8.22	7.55
Pontiac	42,360	38,314	27,642	203,381	134,817	7.06	6.30
Oldsmobile	35,092	31,690	21,650	168,331	113,770	5.84	5.32
Dodge	31,651	30,249	31,344	160,383	131,016	5.57	6.12
Mercury	17,768	21,317	16,686	119,468	89,663	4.15	4.19
Nash	14,031	15,076	16,769	86,540	72,256	3.00	3.38
Studebaker	17,079	19,318	15,627	84,051	89,758	2.92	4.19
Chrysler	15,307	14,771	11,902	81,555	61,518	2.83	2.87
De Soto	11,717	11,620	8,972	62,595	47,608	2.17	2.22
Cadillac	10,324	9,728	8,301	56,461	42,017	1.96	1.96
Packard	7,710	7,725	7,553	44,539	35,309	1.55	1.65
Hudson	7,348	7,541	8,300	38,556	40,369	1.34	1.89
Willys	3,942	4,521	4,414	27,355	17,724	.95	.83
Lincoln	5,010	4,596	2,807	21,563	12,476	.75	.58
Kaiser	2,657	2,559	3,951	15,438	19,797	.54	.93
Henry J	1,142	1,000	4,035	7,069	17,486	.25	.82
MG (British)	752	730	831	3,998	3,232	.14	.15
Hillman (British)	502	408	428	2,563	2,096	.09	.10
Ford (British)	334	303	332	2,295	1,805	.08	.08
Jaguar (British)	381	339	266	2,156	1,337	.07	.06
Austin (British)	284	275	413	1,942	2,523	.07	.12
Allstate	100	57	171	421	738	.01	.03
Misc. Domestic	221	215	347	1,181	2,705	.04	.13
Misc. Foreign	660	593	388	3,489	2,048	.12	.10
Total—All Makes	542,193	540,575	423,655	2,880,025	2,139,875	100.00	100.00

* Based on data from R. L. Polk & Co.

Electric Auto-Lite Expands Abroad

Electric Auto-Lite Co. will build two new plants this year, one in Canada and one in Mexico. The Canadian unit will be in Calgary, Alta., and the Mexican plant will be at Mexico City. The company did not reveal the size of the new units nor the cost. The new plants will go into operation sometime next year.

Chain Belt Acquires Shafer Bearing Corp.

Chain Belt Co. has announced the purchase of Shafer Bearing Corp. for the purpose of broadening markets for its power transmission products. The new addition will operate as the Shafer Bearing Div. of Chain Belt Co.

Stanley Expansion

Stanley Aviation Corp. has virtually completed a $100,000 expansion of its plant. The company has also taken an option on 20 acres of land at Denver, Colo., for construction of a $500,000 plant in the West.

M-H Gets AF Order

Minneapolis Honeywell Regulator Co. has been awarded an Air Force contract totaling $16.85 million for a new type electronic automatic pilot. The unit guides jet fighters electronically to the target. It will require about two years to complete the order.

Kaiser May Drop Chase

It is reported that the Kaiser interests are negotiating an agreement with Chase Aircraft Co. of West Trenton, N. J., which would result in a change in the present relationship in the two organizations. Currently Henry J. Kaiser Co. holds a 49 per cent stock interest in Chase, which designed the C-123 military transport plane. Until the Air Force cancelled K-F's plane contracts recently, production of the C-123 had been planned for the Kaiser Willow Run plant following completion of the C-119 contract. It is believed that negotiations may lead to complete separation of the two companies.

AND AVIATION INDUSTRIES

Foreign Car Sales Jump 30 Per Cent

Registration figures for the first five months of this year show that sales of foreign cars are ahead of the same period a year ago by approximately 30 per cent. American made cars, however, have shown an even greater increase totalling nearly 37 per cent ahead of the first five months of 1952. Number-wise, foreign cars are an almost insignificant factor, accounting for 13,632 through the end of May of this year, about 0.58 per cent of the market.

Ford of Canada Output Forges Ahead Rapidly

Ford Motor Co. of Canada, Ltd., achieved a new milestone in its history when it built its 100,000th vehicle of the year on July 21. This is the earliest date in a year on which the company has attained the six-digit mark.

The 71,163 cars manufactured by Ford in the first half of 1953 represented a substantial increase over the 38,678 cars turned out in the first six months of 1952, but the 17,914 trucks produced was below the previous year's total of 28,576. Total cars and trucks aggregated 89,077 this year against 67,254 in the first half of 1952.

Canadian Vehicle Sales Show a Distinct Rise

Canadians spent nearly $700 million on new motor vehicles during the first six months of 1953, an increase of 28 per cent over the same period last year.

Sales of new vehicles in the January-June period totaled 274,039, valued at $687,883,412, compared with 212,566 vehicles worth $538,433,773 in the corresponding months a year ago.

GM Australian Unit Sets Profit Record

The General Motors Australian subsidiary, General Motors-Holden, Ltd., is following in the parent corporation's footsteps as the leading company in profit position in its country. The subsidiary had net income last year of approximately $8.943 million, the highest ever earned by an Australian firm. An interesting note is that its income taxes amounted to about $8.979 million, or slightly more than earnings. General Motors-Holden lost about $1.115 million in its first two years, while tooling up for production of its six-cyl car, which now is the highest seller in Australia. However, in the five subsequent years profits have totaled more than $18.6 million. In 1952 the company turned out 31,945 vehicles.

Red China is said to be building its first automobile manufacturing plant, at Mukden, with Russian equipment.

Continued on Page 98

1953 RETAIL CAR SALES BY PRICE GROUPS*

NUMBER OF CARS

	June				Six Months			
	1953		1952		1953		1952	
Price Group	Units†	% of Total	Units†	% of Total	Units†	% of Total	Units†	% of Total
Under $2,000	284,387	52.76	216,497	51.45	1,536,422	53.67	1,127,404	53.03
$2,001 to $2,500	159,413	29.57	124,418	29.56	813,287	28.41	649,582	30.55
$2,501 to $3,500	71,961	13.35	61,860	14.70	391,785	13.68	263,606	12.40
Over $3,500	23,297	4.32	18,074	4.29	121,428	4.24	85,502	4.02
Total	539,058	100.00	420,849	100.00	2,862,922	100.00	2,126,096	100.00

DOLLAR VOLUME OF SALES*

	June				Six Months			
	1953		1952		1953		1952	
Price Group	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total	Dollars	% of Total
Under $2,000	$506,670,848	44.24	$382,206,793	43.01	$2,749,975,027	45.10	$1,989,302,743	44.62
$2,001 to $2,500	354,350,411	30.95	275,012,202	30.94	1,815,540,969	29.77	1,440,214,997	32.31
$2,501 to $3,500	197,515,454	17.25	165,623,931	18.63	1,075,076,249	17.63	714,394,436	16.03
Over $3,500	86,510,023	7.56	65,990,146	7.42	457,430,060	7.50	313,602,737	7.04
Total	$1,145,046,736	100.00	$888,833,072	100.00	$6,098,022,325	100.00	$4,457,514,913	100.00

*—Calculated on basis of new car registrations, as reported by R. L. Polk & Co., in conjunction with advertised delivered price at factory of four door sedan or equivalent model. Does not include transportation charges or extra equipment.
†—New registrations of American made cars only. Does not include imported foreign cars.

REGIONAL SALES OF NEW PASSENGER CARS

Zone	Region	June 1953	May 1953	June 1952	Six Months 1953	Six Months 1952	Per Cent Change: June over May	Per Cent Change: June over June 1952	Per Cent Change: Six Months 1953 over 1952
1	New England	31,188	33,769	25,336	167,704	126,151	− 5.64	+23.10	+32.94
2	Middle Atlantic	110,209	101,887	80,778	544,121	403,536	+ 8.17	+36.43	+34.84
3	South Atlantic	56,605	65,996	50,884	327,322	256,463	−14.23	+11.24	+27.63
4	East North Central	148,803	143,598	107,769	760,467	551,388	+ 3.62	+38.06	+37.92
5	East South Central	22,979	24,232	19,639	134,888	99,982	− 5.17	+17.01	+34.91
6	West North Central	52,597	55,927	42,547	285,178	212,258	− 5.95	+23.62	+34.35
7	West South Central	46,937	47,997	36,519	259,924	190,110	− 2.21	+28.53	+36.72
8	Mountain	16,381	17,048	15,393	94,559	72,048	− 3.91	+ 6.42	+31.24
9	Pacific	56,494	50,121	44,790	305,862	227,939	+12.72	+26.13	+34.19
	Total—United States	542,193	540,575	423,655	2,880,025	2,139,875	+ 0.30	+27.98	+34.59

States comprising the various regions are:—Zone 1; Conn., Me., Mass., N. H., R. I., Vt.—Zone 2; N. J., N. Y., Pa.—Zone 3; Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va.—Zone 4; Ill., Ind., Mich., Ohio, Wis.—Zone 5; Ala., Ky., Miss., Tenn.—Zone 6; Iowa, Kan., Minn., Mo., N. D., S. D.—Zone 7; Ark., La., Okla., Tex.—Zone 8; Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo.—Zone 9; Cal., Ore., Wash.

Men in the News

Ford Tractor Div.—Election of Thomas A. Farrell, formerly president of Dearborn Motors Corp., as vice-president and general manager, and as a member of the administration committee of Ford Motor Co., has been revealed.

Ford Tractor Div.—**Merritt D. Hill,** formerly general sales manager and vice-president of Dearborn Motors, is assistant general manager. **V. A. Best** has been named divisional controller. Formerly he was treasurer and a director of Dearborn Motors. **R. E. Hunt** has been appointed general manufacturing manager; formerly he was vice-president in charge of engineering and manufacturing for Dearborn Motors. **Dale Roeder,** formerly executive engineer for all Ford commercial vehicles, has been named chief engineer. Other appointments include **E. F. Keller** as general manager of Wood Brothers, Inc., Des Moines, Ia., subsidiary; **I. R. Kappler,** general purchasing agent; **J. J. Mooney,** industrial relations manager, and **E. Scott Rumely,** product planning and programming manager.

Continental Aviation & Engineering Corp., Turbine Div.—**Rollin M. Russell** has been appointed manager.

Champion Spark Plug Co.—**R. L. Anderson** has been named aviation service manager.

Wellman Bronze & Aluminum Co.—**E. J. Vargo** is now assistant production manager.

Raybestos-Manhattan, Inc.—**A. N. Rouse** is now Southern California special representative to the aircraft and allied industries.

Goodyear Tire & Rubber Co.—**Arden E. Firestone** was made secretary of the company, succeeding **W. D. Shilts.**

Marquardt Aircraft Co.—**Paul J. Papanek** has been named eastern district manager.

Dana Corp.—**R. R. Burkhalter** has been promoted to assistant executive engineer. Promotions of **Philip Mazziotti** to chief engineer of the Universal Joint Div. and **Robert Carter** to the post of Universal Joint engineer were also announced.

Lock Thread Corp.—**M. C. Teague** has been appointed president.

Convair San Diego Div.—Paul S. Nill has been named controller.

General Electric Co., Component Products Div.—**Robert C. Hanna** has been appointed manager of marketing.

Banite Co.—**Frank W. Lake** was made sales manager.

Ford Motor Co. — **Raymond J. Schwanekamp** has become manager of the manufacturing engineering department at the Buffalo Assembly plant.

Link Aviation, Inc.—**Alfred A. Bucci** was promoted to manager of subcontracts.

Bendix Aviation Corp., Hamilton Div.—**John T. Marshall** has been made chief engineer, while **Robert W. Scott** is now chief liaison engineer to the assistant chief engineer.

Lee Rubber & Tire Corp., Republic Rubber Div.—**J. A. MacIntire, Jr.,** has been appointed assistant manager of wire braid hose sales.

Electric Auto-Lite Co., Spark Plug Div.—**William F. Connolly** has been named Eastern Div. manager, while **Charles J. Murphy** assumes his former position as Boston district manager.

Chrysler Corp., Engineering Div.—**J. W. Duhn** and **H. R. Voorhees** are now assistant chief engineers in the electrical section.

Bendix Aviation Corp., Bendix Products Div.—**Frank E. Bremer** has been appointed service manager for aircraft products.

International Harvester Co., Motor Truck Div.—**W. E. Callahan** was chosen central region sales manager.

Gar Wood Industries, Inc., Richmond Div.—**Mark L. Shepard** is now manager.

Borg & Beck Div., Borg-Warner Corp.—**D. E. Gamble** has been named chairman of the supervisory board, and **T. L. Knecht** has been chosen president and general manager.

Detroit Arsenal — Col. Benjamin Whitehouse, with Packard from 1929 to 1942, has assumed command.

Automatic Transportation Co. — Bernard M. Kewin has been promoted to advertising manager.

Cooper Alloy Foundry Co.—**Clayton L. Heintz** has been named manager of distribution.

Chrysler Corp., Engineering Div.—**John C. Guenther** has become director of the technical information section.

Van Norman Co.—**Roger L. Pyne** is now concentrating on engineering phases in the Machine Tool Div., while **Herbert L. Freer** was named general sales manager. **Edward C. Hellyer** is now production planning manager, while **George A. Raiche** is advertising manager.

Bohn Aluminum & Brass Corp.—**David E. Clark** has been appointed traffic manager and **F. Milford Taylor** has been made a director.

Plymouth Motor Corp.—**Robert E. Dietz** has become assistant to the director of regions at Detroit.

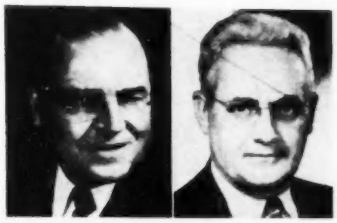
Chrysler Corp. of Canada Ltd.—**Robert T. Brown** has been appointed advertising manager.

Canadian Nickel Co., Ltd.—**Ralph D. Parker** has been elected president.

F. L. Jacobs Co.—**Thomas J. Riggs, Jr.,** has been appointed executive vice-president.

Shakeproof Div., Illinois Tool Works —**Silas S. Cathcart** has been chosen manager of the plastics department.

B. F. Goodrich Co., Tire & Equipment Div.—**Edwin J. Lewis** has been named manager, passenger car tire sales, while **Thomas I. Jenkins** is assistant manager.



Gemmer Mfg. Co.—Eugene F. Wambold, vice-president, manufacturing, and William A. Blume, vice-president, sales have been elected directors.

Ford Div.—R. S. McNamara was appointed assistant general manager of the division. He is succeeded as Ford Motor Co. controller by A. R. Miller.

Cadillac Motor Car Div.—William J. Tell was named to the new post of staff engineer in charge of future body and sheet metal styling. He is succeeded as staff engineer in charge of body and sheet metal design by Daniel M. Adams. Lawrence L. Kortkamp, lower left, was named automotive product improvement engineer, and Clarence E. Morphew becomes assistant staff engineer for sheet metal.

Mack Trucks, Inc. — Albert G. Crockett was appointed director of the newly-formed sales development division.

Chrysler Corp.—Edgar L. Bailey has retired as staff electrical engineer after 23 years service.

Parker Appliance Co. — Reginald P. MacDonald has been named sales engineer for the Engine Accessories Div., specializing in jet engine components.

Clark Bros. Co. — Robert R. McCartney is now eastern division manager and director of export operations.

Budd Co.—**A. Dix Leeson** has been named advertising manager.

Chrysler Corp., Export Div.—**Edward D. Heins** has been chosen chief engineer.

Dow Chemical Co.—**Ralph M. Hunter** has been advanced to the position of staff coordinator of all electrochemical activities.

American Brake Shoe Co., Brake Shoe & Castings Div.—**Raymond A. Frick** has been appointed vice-president.

Republic Aviation Corp. — **Ernest Wengimann** became factory superintendent, while **Ralph Bonafede** is assistant to the factory manager.

General Motors Corp., Building Div. —**F. Emmett Dacey** has been named manager.

Boeing Airplane Co.—**Evan M. Nelsen** was elected treasurer; **Clyde Skeen,** controller; and **James E. Prince,** secretary.

Rosan, Inc.—**Stanley E. Ridderhof** has been named vice-president.

Northrop Aircraft, Inc.—**William M. Steffen** has been named general supervisor of materials and process engineering.

Ford Motor Co.—**Gerald J. Lynch** has been named executive assistant to **J. R. Davis,** vice-president and group executive.

Axelson Manufacturing Co.—**Douglas M. Jones** has been appointed chief engineer.

Eaton Manufacturing Co., Pump Div.—**Richard H. Berge** has been promoted to plant manager.

Haartz-Mason, Inc.—**T. H. McConnell, Jr.,** was named general manager of the newly-formed mechanical products division.

Carboloy Dept.—**Charles W. Kapplinger** has joined the firm as a metallurgical engineer.

Pacific Airmotive Corp. — **J. D. Strickland** has been named sales manager—aircraft operations.

Detroit Gear Div., Borg-Warner Corp.—**T. J. Ault,** formerly vice-president and purchasing agent of Warner Gear Div., is now vice-president and assistant general manager.

Pontiac Div.—**W. H. Knisley** was promoted to supervisor of plant layout, methods engineering and planning for commercial activities. **H. H. Wood** is general supervisor of time study and cost estimating for commercial plants, and **M. H. Taylor** is general supervisor of standards on defense activities.

Necrology

William J. Brewer, 56, director of purchases for Buick Motor Div. of General Motors Corp., died Aug. 12 at Flint, Mich.

Linwood A. Miller, 68, former president of Willys-Overland Co. and vice-president of Graham-Paige Motors Corp., died Aug. 3 at Chicago.

Merrill W. Kane, 60, assistant business manager of Chevrolet Motor Div. of General Motors Corp., died Aug. 6 at Detroit.

William H. Tether, 84, former plant executive with Maxwell-Briscoe Motor Car Co., Oakland Motor Car Co., and AC Spark Plug Div. of General Motors Corp., died Aug. 10 at Norwalk, O.

L. M. Klinedinst, a former vice-president and director of Timken Roller Bearing Co., died Aug. 10 at Canton, O.

A. L. Beneke, 60, secretary-treasurer of Wheeling Corrugating Co., died Aug. 9 at Wheeling, W. Va.

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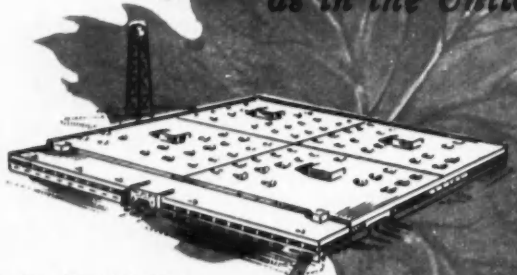
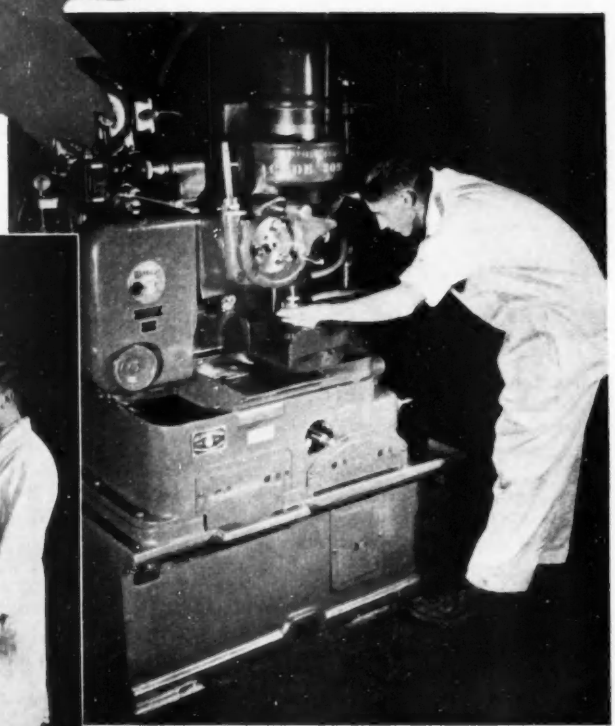


Canadian Pratt & Whitney's new 340,000 sq. ft. plant at Ville Jacques Cartier, Quebec.



At the Canadian Pratt & Whitney plant, a number of small fine-pitch external gears are cut to a high degree of accuracy on Fellows 7-Type Gear Shapers.

For its R1340 Wasp engine production tooling, Canadian Pratt & Whitney relies on the Fellows 36-Z-Type (12" Straight Hole Work Spindle) Gear Shaper for precision cutting of both the external and internal splines on the crankshaft and the cam-ring internal gear.

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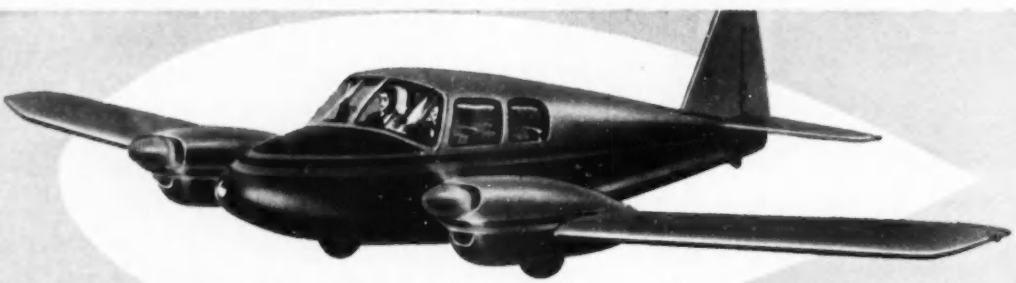
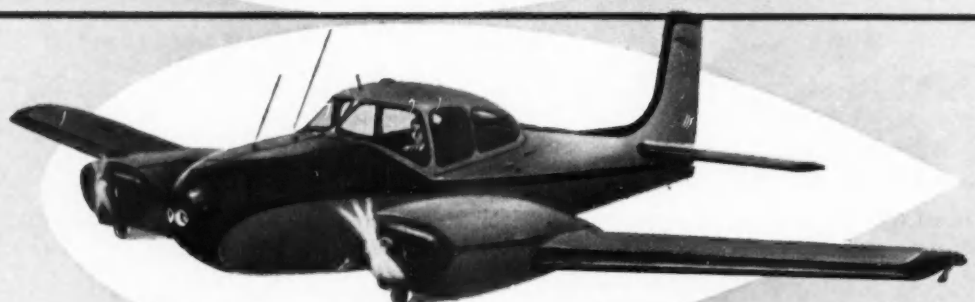


Piper Apache. Seats 4. Dependably powered by two 150-h.p. air-cooled Lycoming engines.



Riley Twin Navion Conversion. 4-place executive plane powered by two 150-h.p. air-cooled Lycoming engines.

Typical shell molds bonded with BAKELITE Phenolic Resins

Latest Advance in Shell Molding...

New BAKELITE TRADE-MARK Phenolic Resin BR-12011S Simplifies Making of Molds

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- **They retain their strength for longer periods at curing temperatures.**
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- **They resist the tendency to distort on ejection from the hot pattern plate, insuring better mating of mold halves.**
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For technical data on BAKELITE Resin BR-12011S and the shell molding process, write Dept. RY-59.

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The shell molding process uses thin, lightweight shell molds made of fine-grained sands bonded with BAKELITE Phenolic Resins. This process provides:

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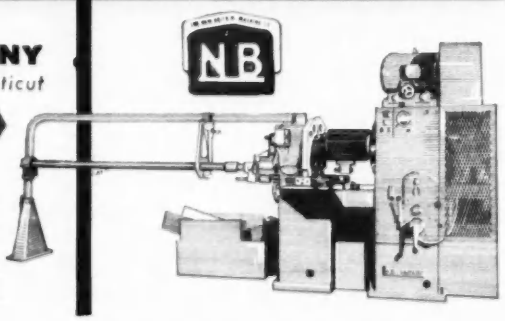

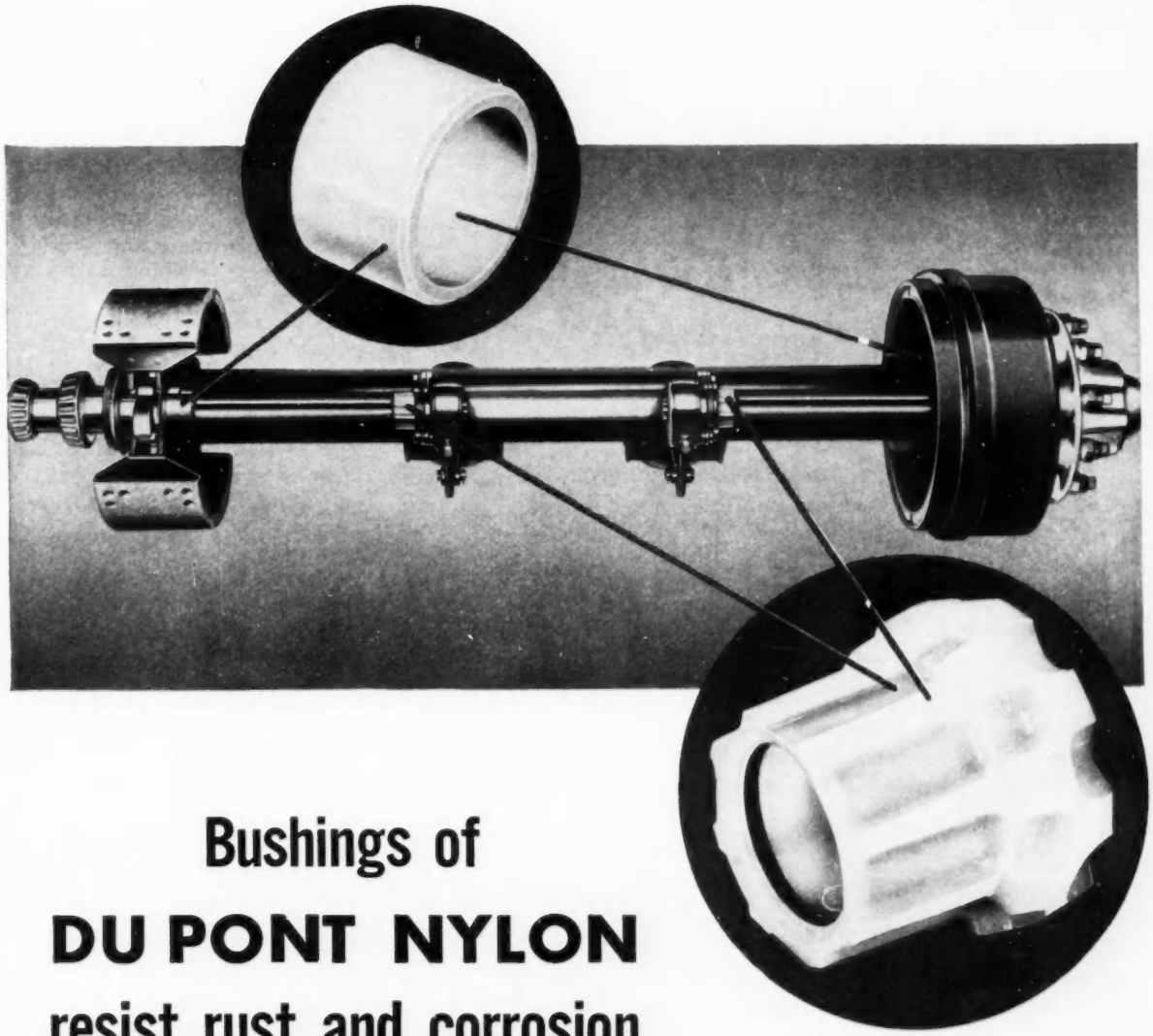

Bushings of DU PONT NYLON resist rust and corrosion ...reduce brake camshaft wear

After testing many materials, The Timken-Detroit Axle Company has now standardized on molded DuPont nylon bushings in truck brake camshaft assemblies. Results of both laboratory and field tests reveal that molded nylon bushings have superior wearing qualities. They never rust or corrode. Camshaft journal wear is minimized even when the nylon bushings are not lubricated because of neglect—or are lubricated improperly. Galling and brinnelling of the brake camshaft have been completely eliminated by the application of nylon bushings. And the resilient nylon bushings do not flatten out after high mileage.

Parts molded of Du Pont nylon are tough, lightweight, dimensionally stable. They are unaffected by continuous operation to 250°F. And through mass production by injection molding, production costs are often lowered and assemblies simplified.

Forward-looking automotive engineers are finding that the unique properties of Du Pont nylon are making possible many of their ideas for improved design and performance. Perhaps these properties can help blueprint your development program. For further information on Du Pont nylon plastics, write: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 179, Du Pont Bldg., Wilmington 98, Del.

Nylon bushings molded for The Timken-Detroit Axle Co., Detroit, Mich., by St. Clair Plastics Corp., Marine City, Mich.

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AUTOMATIC CONTROLS

for Surface Finishing Jet Engine Parts

By R. J. Thomas, Chief Metallurgist
The Studebaker Corp.,
New Brunswick, N. J.

A MODERN, one-story brick and steel structure in New Brunswick, N. J., to machine, heat-treat and surface-finish hundreds of parts for the J-47 jet engine made by General Electric Co., was recently opened by the Studebaker Corp.

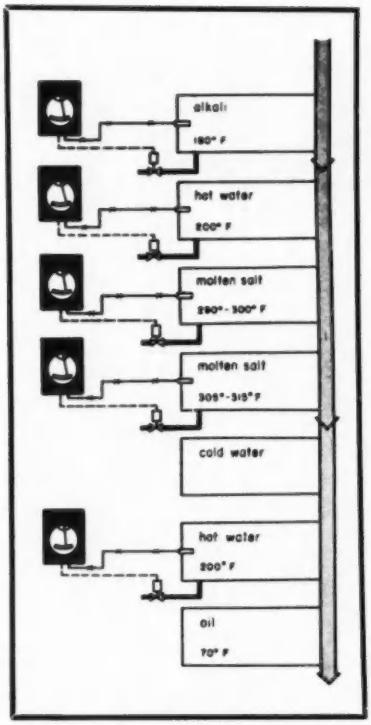
Engine parts, processed in the new 400,000-sq-ft plant which is under lease by the U. S. Air Force, are produced under automatically controlled conditions. The extensive instrumentation, much of it developed in collaboration with Minneapolis-Honeywell Industrial Division engineers, includes automatic temperature and combustion safeguard control as well as automatic regulation of anodizing, dichromating and black oxide finishing equipment.

Typical castings and forgings machined and finished at the plant include aluminum, magnesium and special steel housings, seals, connectors, retainers and miscellaneous accessory fittings and fixtures.

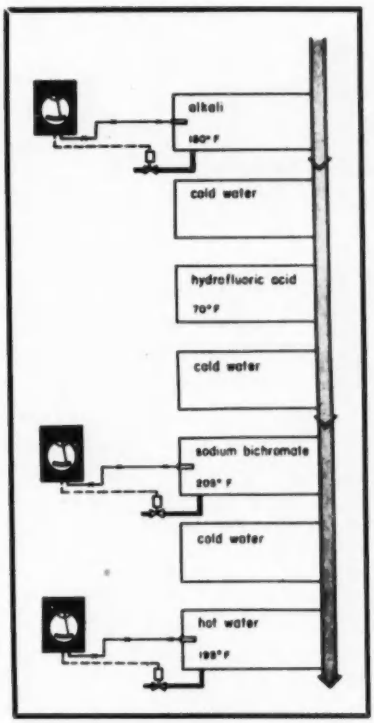
All of the heating and electrical apparatus in the new 1300-ft long plant is housed overhead in five centrally located "mezzanine" sections under the roof. This arrangement provides extremely open working areas for assembly operations, and the interior has the appearance of several football fields joined end to end with steel columns, like goal posts, neatly placed throughout.

The three surface finishing operations all employ the

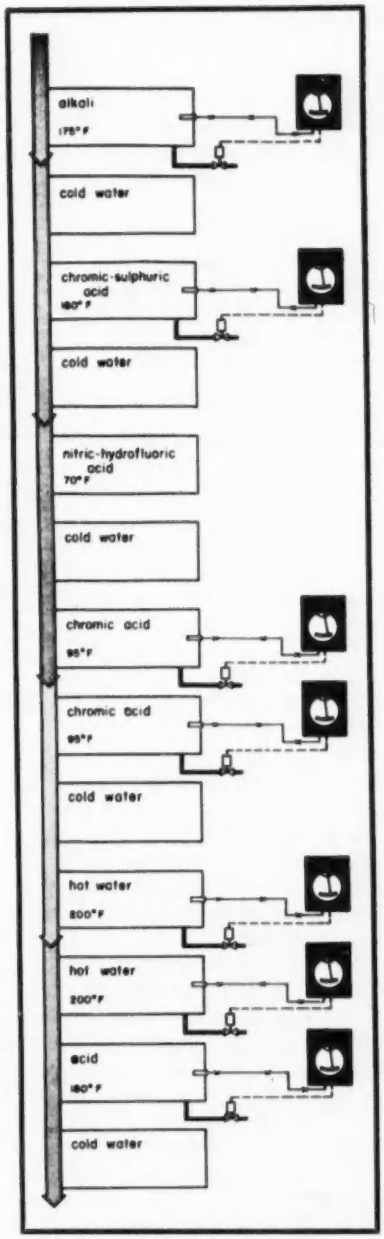
Down-the-aisle view in plant showing location of mezzanine floors.



Schematic diagram of a black oxide line.



Arrangement of units in dichromating line.



BLACK OXIDE DICHROMATING AND ANODIZING LINES *(Schematic)*

Flow of material through the anodizing line.

same general type of chemical treatment to condition parts surfaces for resistance to corrosion, paint adhering qualities, color, and other surface requirements.

All ferrous parts are finished in a black oxidizing process employing essentially a molten salt bath (caustic solution containing sodium and potassium nitrates). The resulting blackened parts are finally dipped in oil prior to packing and shipment.

Aluminum castings and forgings are finished by a variety of procedures to produce certain desired surface properties. The aluminum line comprises caustic, chrome-sulphuric acid, nitric-hydrofluoric acid, chromic acid anodizing, cold wash and hot seal tanks. The basic anodic coating procedure, for example, uses chromic acid as an electrolyte, and is effective for producing a relatively thin lay (0.00005 to 0.0001 in.) of aluminum oxide for corrosion and wear resistance and as a base for paint. Other procedures are employed to remove stains from annealing and heat treating operations, to produce a smooth bright finish, and for various other purposes.

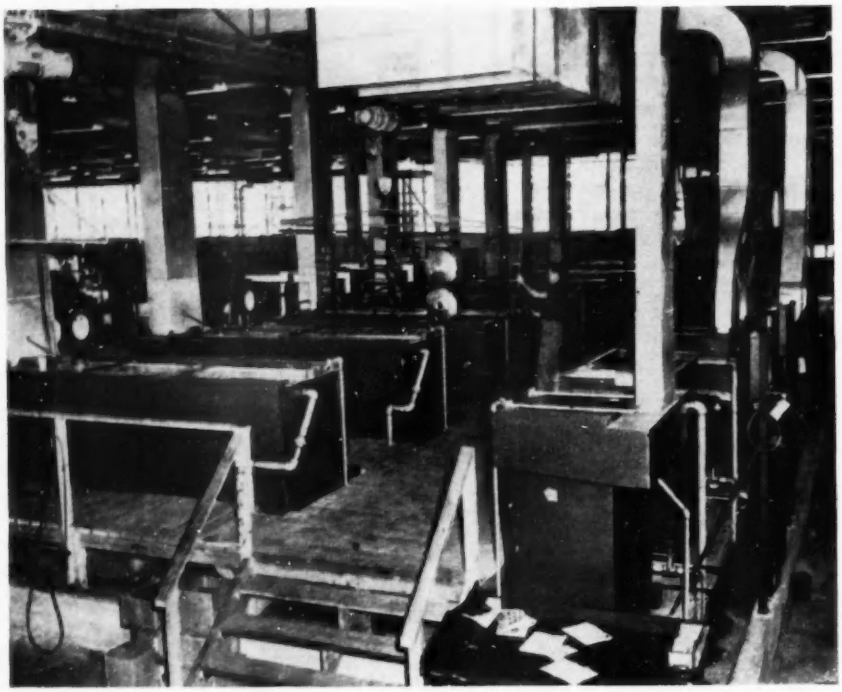
Magnesium jet engine parts are finished by the dichromate treatment which affords good corrosion resistance and paint adhering qualities. Parts to be finished are initially cleaned in an alkali tank, rinsed, dipped in cold hydrofluoric acid, rerinsed, held for almost an hour in hot sodium bichromate, rinsed again in cold and in hot water, and dried. In all of the above operations requiring the application of heat, precise temperature control is always needed in order to assure bringing of the process to a successful conclusion.

Automatic Control

In all of the aforementioned chemical treating operations, bath temperatures are automatically controlled in order to eliminate the human element and attendant possibility of error, maintain required constant temperatures, and provide safe operation. As noted in the accompanying flow diagrams, each tank equipped with heating elements has an individual temperature

and combustion safeguard control system. Gas - fired immersion heaters are utilized on all heated baths. Only the chromic acid and strip tanks are equipped with water jacketing.

In each heated tank, temperature is maintained within close limits by a Brown indicating thermometer controller with the bulb of the filled system dipped in the solution. Within the instrument, an Electr - O - Vane control unit, which comprises a vane, electronic oscillator circuit and load relay, is differentially connected with the temperature control index and the pointer to operate an electric circuit at the slightest departure of the pointer from the index. A solenoid valve mounted in the gas line feeding the inspirator type burner is thus cycled as dictated by the control thermometer.



Anodizing line, left, and dichomating line, right. Aluminum parts are being dipped into the chromic acid tank for anodic coating.

In addition, each tank with temperature control is equipped with Honeywell Protectoglo combustion safeguard equipment to protect both equipment and operators in the event of flame failure. The electronic Protectoglo relay with its attendant red signal light is mounted so as to be within plain view and easy access of the operators. The safety system also features a combined flame detector and gas pilot burner assembly mounted at the mouth of the venturi type burner, a Maxon Premix safety shut-off valve on the main fuel line, and a pilot solenoid to provide automatic cut-off on flame failure.

The Protectoglo combustion safeguard system instantly recognizes flame failure when it occurs, operating immediately to shut off the fuel supply. The system also assures that no fuel flows to the burners, unless all safety precautions have been followed in proper sequence. It operates on the flame rectification principle, which is based on the fact that flame is capable not only of conducting an electric current, but is also capable of rectifying an alternating current. The Protectoglo system utilizes this principle by applying alternating current to an electrode inserted in the flame. The resultant rectified current, which can be produced only when flame is present, is in turn detected by the Protectoglo relay, which, in turn, supervises operation of the system.

Space Heating Controlled

Positive automatic temperature and combustion safeguard controls for supervising building heating are also extensively employed. The five mezzanine sections are all equipped with oil-fired Dravo 2,000,000 Btu hr "ceiling" furnaces. Each of the 22 furnaces has M-H Modutrol motors modulating the fuel input and regulating the fresh air-return air dampers. Flame failure protection is provided with Honeywell photocell type combustion safeguard controls. In addition to the basic mezzanine heating unit, several small unit heaters are installed close to the various exits to compensate for heat losses when doors are opened. These locally mounted units are interlocked so that when the doors are opened the burners start or remain on.

It's apparent that instrumentation plays a vital role not only from the production standpoint of supervising finishing operations but also from that of keeping the building comfortable and maintaining human efficiency at its highest.

Production Rate of Turning Crankshafts Increased Seven Times

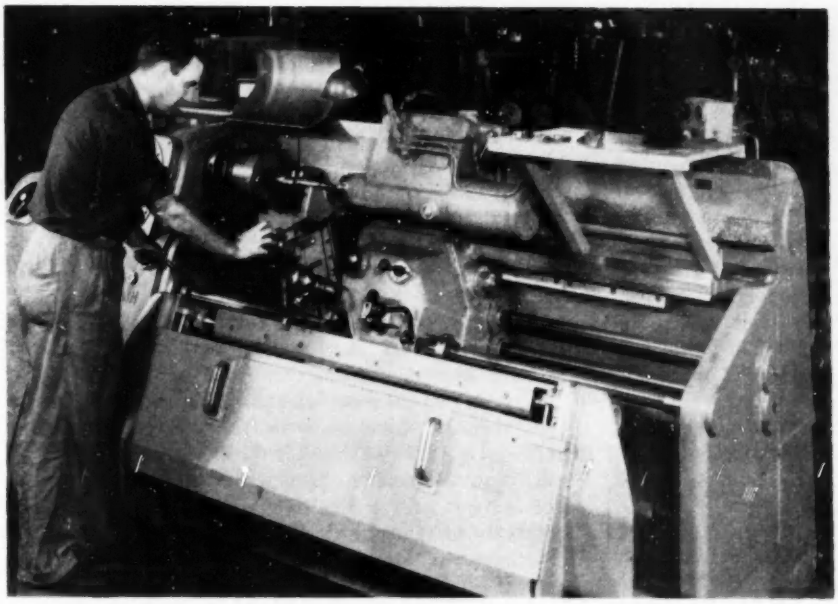
OUTSTANDING efficiency in metal removal has been attained by Continental Motors Corp., Detroit, Mich., in adopting a new method for turning of the shaft ends on single-throw crankshafts for the line of small, single cylinder engines produced for use in lawn mowers, garden tractors, and other applications.

The present installation consists of two New Britain "GF" Copying lathes—one for handling the front shaft extension; the other for the rear end. The two machines, operating on an automatic tracer cycle, are controlled by a single operator. Using three single-point solid carbide tools, they are capable of machining 120 crankshafts per hour with one operator. The original setup, following conventional lines, required four automatic lathes, fitted with 22 tools, and two operators to produce only 35 pieces an hour.

But this is only part of the story. The previous method produced only the rough-turning operation which was followed by rough-grinding prior to heat treatment. The latter operation employed four grinders and four operators. The NB Copying lathe not only makes 120 pieces an hour, almost seven times the rate of the original equipment but it turns out the work in semi-finished state, rather than rough-turned.

This makes it possible to eliminate the rough-grinding operation entirely. It is obvious that this alone has made it possible to release four grinders and four operators for other work. Moreover, the setup now is extremely compact, releasing valuable productive floor space for other operations.

Looking at the machines more in detail, it will be noted that both are alike, using a vertical type main front slide, fitted with a solid triangular carbide tool bit which provides six sharp cutting edges before the tool must be ground. As a matter of fact, Continental is getting 100 pieces per cutting edge so that grinding is required only after producing at least 600 pieces or five hours' production. Incidentally, cutting is done dry.



Close-up of New Britain copying lathe on the first operation at Continental Motors plant in Detroit. This operation turns one end of the single-throw crankshaft.

The first machine, using a single tool slide turns in a single, fast cycle — four steps of different diameter, an intermediate groove, and two blind end faces directly from the rough forging. Maximum depth of cut on the smallest diameter is around 3/16 in. Spindle speed is 1950 rpm and feed is 0.014 in. per revolution. Both lathes have 20-hp electric motor drive.

The second machine then takes the opposite end of the shaft, semi-finish-turning from the rough — five steps of different diameter, including a gear, a taper, and two faces. Here,

(*Turn to page* 106)

Solving Automotive Problems With Automatic Computers

A New Tool for Engineers

By Arvid W. Jacobson, Director
and
Harry D. Huskey, Technical Director

Computation Laboratory
Wayne University, Detroit, Mich.

THE mechanization and electrification of the repetitive manual operations in production and distribution have multiplied manyfold man's productivity in the last 50 years and have brought about great improvements in the material and cultural conditions of our society. Much less automation, however, has occurred in the field of record-keeping and information processing.

Engineering and Scientific Fields

In engineering and scientific applications there is a diverse array of distinct problems to be done. There are always new problems to be solved which have never been done before, and since the computer is a tool in this research it must be general purpose in order to be useful.

In contrast to business application machines, usually the scientific or engineering computer does not have to handle a large amount of data. On the other hand many more arithmetic operations may be required to obtain results. Thus, calculators for engineering and scientific problems require smaller memories than those for business applications, and they generally perform arithmetic operations at a much higher rate.

A problem dealing with the behavior of overhead valves in automobile engines, which would have required the lifetime of two individuals using desk calculators, was solved at Wayne University in a matter of weeks on the first of the mechanical computing machines. And this study disclosed a far greater amount of information than could have been obtained at a prohibitive cost by experimentation involving toolroom techniques.

Many Automotive Uses

A great deal of computing on desk calculators or simpler devices is being done in the design, production and inspection of gears, cams, springs, crank and cam shafts, bearings, torque converters and the like. However, even in these calculations, while involving for the most part numerical evaluation of known formulas, the use of an automatic computer can effect substantial savings in cost and at the same time relieve personnel for other more productive work. When the calculation deals, for example, with off-standard design of gears to achieve maximum strength and durability, or when repeated calculation is necessary to realize an optimum compromise among the properties of a spring and the space it occupies, the advantage of machine computation becomes evident. In evaluation of systems of the algebraic equations arising in the study of critical speeds of rotating shafts, of stresses in indeterminate car body structures, or in spectroscopic analysis of chemical solutions, the amount of calculation by non-automatic means becomes too time-consuming.

MACHINE computing is finding increased use in the automobile and aircraft industries, as in all fields of research, design, and production. Some of the uses include calculation of data for generalized design studies, simulation of motion and control problems, control of inventory and scheduling, forecasting, and actual control of machines and processes.

Three aspects of the computer subject in relation to the industry are brought together in this article. The Wayne University program for aiding industry in computing problems is outlined at the left. A simple control problem confronting the Woodward Governor Co. is shown on page 55, with the machine that solved it shown at the right. And finally, points to consider in selecting a computer are discussed by a General Electric Engineer, on page 56.

The large scale computer is well suited to the study of thermodynamic cycles in an engine, heat conduction in car brakes or around the spark plug, gas flow in a fuel system and fuel combustion, torsional vibration of crankshafts, electrical transients in the ignition system and others.

The performance of an automobile on the road is controlled by many factors, and the mathematical formulation of this so-called ride problem, including directional stability, is a complex one. Yet a judicious use of computers and seasoned engineering judgment can yield substantial progress in producing more comfortable and safer automobiles. In the overall body and grille design, consideration of the aerodynamical properties need to be taken into account to reduce air resistance and noise, and improve cooling.

Other applications for machine computation relate to investigations into a new kind of automobile power plant such as the turbine. If this and other developments are to take place, a host of complex engineering and scientific problems need to be solved.

Controlling Production

Another area of application of both analogue and digital computing is automatic control of machines. This field is mentioned here only to complete the fields of applications enumerated. It needs to be said, however, that the development of the feedback theory, on which automatic control as well as self-regulating machines and organisms depend, is perhaps one of the most important scientific achievements in recent times. Since the feedback principle can be stated in mathematical terms, it enables quantitative methods of investigation to be applied to many processes hereto thought not amenable to such methods.

Wayne University Program

Some three years ago Wayne University initiated the formation of a computation laboratory based on the precept of cooperation between industry and the University. Thanks to the enlightened leaders of Detroit business and industry and their generous support, this effort has succeeded. The University settled on a $500,000 budget for a computer and five years' operation. Massachusetts Institute of Technology donated its prewar mechanical differential analyzer. General Motors Corp., the first firm to be approached, provided $150,000 toward a new Burroughs electronic

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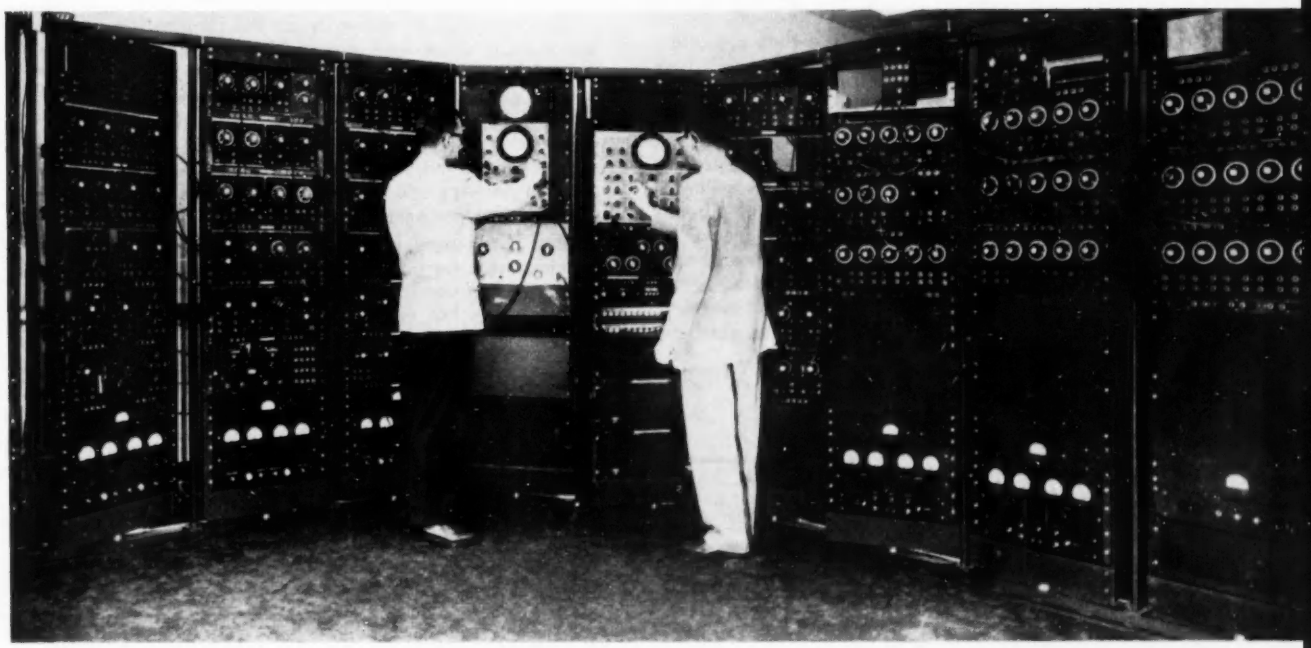


Electronic computer now in use at Woodward Governor Co. as described in the article on page 55.

Companies Participating in Wayne University's Computation Laboratory Program

American Blower Corp.
Bendix Aviation Corp.
Burroughs Corp.
Calumet & Hecla Consolidated Copper Co.
Continental Motors Corp.
The Detroit Edison Co.
Ethyl Corp.
Federal Department Stores
Ford Motor Co.
Fred Sanders, Inc.
General Motors Corp.
J. L. Hudson Co.
Holley Carburetor Co.
Michigan Consolidated Gas Co.
Michigan Tool Co.
Modern Engineering Service Co.
Nash-Kelvinator Corp.
Power Equipment Co.
Rotary Electric Steel Co.
Vinco Corp.

DESCRIPTION OF AN AUTOMATIC CALCULATOR

A high speed automatic calculator consists of a memory unit where numbers and other information may be stored; an arithmetic unit capable of doing arithmetic and certain logical operations on numbers stored in the memory; an input-output system whereby a human operator can insert new information from a keyboard or from punched cards or tape, and a printing mechanism by means of which printed results can be obtained; and a control unit which receives instructions from the memory (actually from the input equipment via the memory), and causes the other units of the computer to perform their proper functions so as to carry out the computation. The accompanying diagram shows the relationship of these parts.

The instructions, or commands, must be properly arranged by a person called a "coder," and then inserted into the input device of the computer. Once in the memory these instructions are fed in sequence to the control unit where they are interpreted as command signals to the other units (see dashed lines in the figure), causing them to perform the functions necessary to carry out the desired computation.

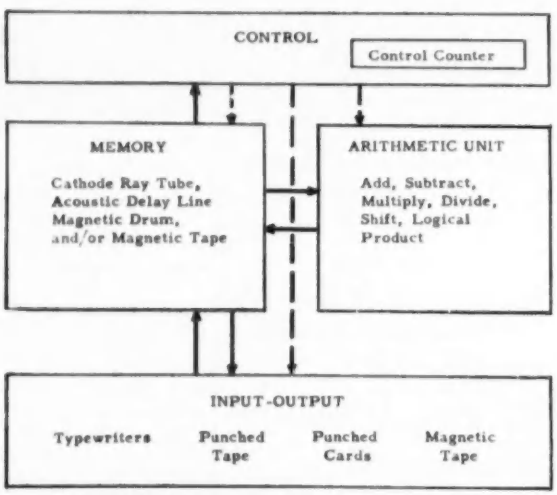
For example, a command when executed by the control unit may cause the next word on an input tape to be read and stored in a certain pigeonhole, or address, in the memory. A sequence of commands may be executed causing the calculator to read a number from the tape, multiply it by some constant previously stored in the memory, and punch a result on another tape or card, or type it on an electric typewriter.

A command counter steps along one unit at a time causing the control to find successive commands in consecutive addresses in the memory. Not only are there arithmetic commands which add, subtract, multiply, or divide pairs of numbers stored in the memory, but there are also so-called logical commands which may, for example, set the command counter back thus allowing certain sequences of commands to be repeated.

The memory used in such calculators may consist of a magnetic drum, wherein the information is recorded in much in the same way that sound is recorded on tape. Other memory systems store information by passing acoustic waves down a column of mercury and recycling the information. Still another type stores charges in certain patterns on the inside of cathode ray tubes. Very recently there is hope of using small magnetic cores or small ferroelectric condensers to store information.

The computers in operation at the present time use vacuum tubes and germanium crystal diodes as their main element. The tubes dissipate a large amount of heat and there is hope of replacing them with transistors in the near future. Transistors are much more efficient (less heat loss), and, furthermore, they will make it possible to package a computer in perhaps one-tenth, or less, space than the present machines occupy.

Most computers use either punched cards or punched tape for imput and output; some transfer from punched cards or tape to magnetic tape on the way into the computer. Output may be an electric typewriter, or devices that print a line at a time, such as a standard desk adding machine or a punched-card tabulator.



BLOCK DIAGRAM OF AN AUTOMATIC COMPUTING SYSTEM

In each block the types of equipment used or the functions performed are listed. The solid lines show paths of numerical and program information. The dashed lines show the paths of command signals from the control to the other units.

computer just installed. Burroughs Corp. added $100,000 and assumed responsibility for $150,000 of operating expenses. Ford Motor Co. added $50,000.

The Computation Laboratory provides a variety of activities designed to acquaint administrative personnel in business with the practical uses of existing machines, and offers consultation to them on questions relating to merits of equipment under consideration for purchase.

Another major function of the Computation Laboratory is to provide a computing service to industry and the University. It is the objective to have a laboratory well enough equipped with sufficient capacity and flexibility to solve problems of great difficulty.

In order to fully develop the educational and research aspects of this program and its service to industry and the University, it is necessary to broaden the base of the participating organizations and secure additional underwriting for its financial support.

Parts Maker Saves *with* Electronic Computer

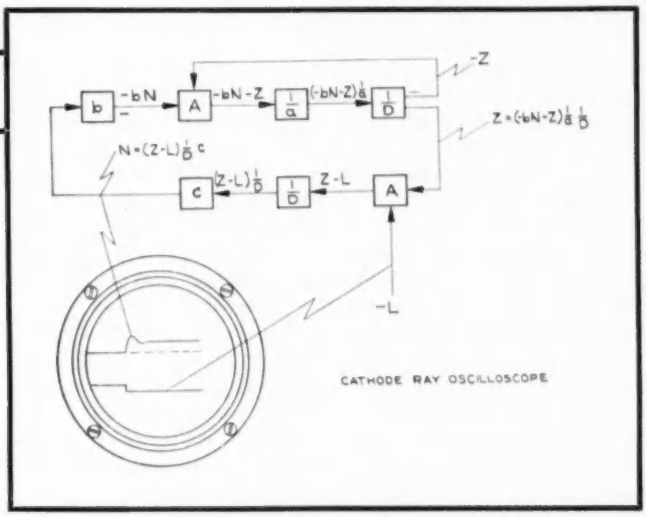


FIG. 1 *Computer system for solving problem presented in text.*

THE capabilities of an electronic analogue computer seemed to fit the needs of Woodward Governor Co. engineers. To explore the possibilities of such a device they built a simple electronic computer several years ago. Studies of the device indicated that much time could be saved in control work. Mathematical computations had required considerable time and labor; as the result of the test computer's success, the present commercial computer was assembled over a period of time.

The electronic analogue computer is fundamentally a group of electronic units of various types, which individually perform certain elementary mathematical operations upon the electrical signal introduced into them, such as multiplication by a constant, raising to a power, integration and differentiation with respect to a variable, algebraic addition of several variables, and the like.

For the purpose of illustrating the use of this equipment, consider this simple example:

Woodward laboratories are concerned with the application of a speed droop governor to a Diesel engine in which system the following variables and parameters are defined:

(1) Variables:
- N deviation from equilibrium speed (rpm)
- Z deviation from equilibrium rack position (inches)
- L external load (in. equivalent rack position)
- t time (sec)

(2) Parameters:
- c rpm per second (acceleration) per unit Z
- a time constant of governor (sec)
- b steady state governor gain (in. Z/rpm)

A typical set of assumptions is:

(1) $DN = c(Z-L)$ for the engine

(2) $(aD+1)\ Z = -bN$ for the governor where D represents the derivative operation d/dt.

This system as represented by the computer may be schematically shown (se Fig. 1). The units 1/a, b, and c are d-c amplifiers, the 1/D's, integrators with respect to time, and the A's algebraic adders. N, Z, and L are represented by voltages at the points shown.

Equation (1) may be arranged: $(Z-L)\ (1/D)\ (C) = N$.

Referring to the schematic and following the directional arrows, Z and −L are added at the A, the sum integrated by 1/D, and the integrated sum multiplied by the constant c to produce N. *(Turn, please)*

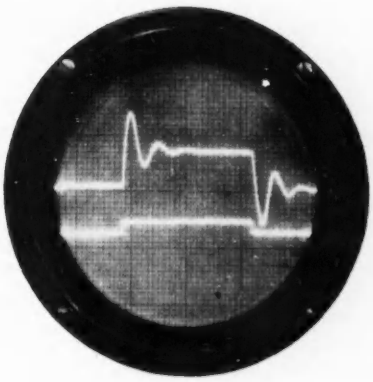


FIG. 2 *Cathode ray oscilloscope when load disturbance is introduced. This represents a mal-proportioned system.*

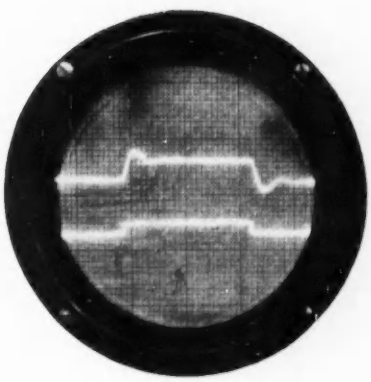


FIG. 3 *Appearance of cathode ray oscilloscope when load disturbance is introduced in a well-proportioned system.*

Equation (2) may be arranged: $(-bN-Z)\ (1/a)\ (1/D) = Z$.

Referring to the schematic and following the directional arrows, N is multiplied by $-b$, added to $-Z$, the sum multiplied by 1/a, and then integrated by 1/D to produce Z.

The behavior of the system is indicated on the cathode ray oscilloscope as a function of time where the vertical coordinates, from top to bottom respectively, represent the speed error, (N) and the load disturbance (L). It is possible to introduce load disturbances of various kinds; those shown in Fig. 2 and 3 are instantaneous load changes, level to level.

The criteria of merit for the system transients for two sets of choices of the parameters a and b, as shown in Fig. 2 and 3, are clearly the relative magnitudes of the maximum speed error, permanent speed error, and the character of the transients with respect to subsidence time and number of oscillations to equilibrium. The objective of the calculation is the adjustment of the parameters a and b, c being fixed for a particular engine, to produce an optimum distribution of desirable characteristics among the several effects enumerated above. Figure 2 represented a malproportioned system; Fig. 3 a well proportioned system.

The consequence of the variation of any parameter in the system can be instantly seen and interpreted; an equivalent process on paper may entail many mathematical operations.

The present computing facilities involve an estimated outlay of $50,000. This figure includes both the cost of commercial components and also the physical layout and production of special elements upon which considerable effort has been expended by our own staff. Maintenance and set-up of the equipment requires the part time services of one electronician from the regular laboratory staff. The equipment may be used on occasion by any of six or seven individuals whose work involves the consideration of this class of problem.

How to Select a Large Scale Digital Computer

By ALLEN KELLER
GENERAL ELECTRIC CO.

IT requires a year or more to build an organization for using a digital computer. Therefore, anyone contemplating the use of one should think in terms of what will be available in 1954 or 1955.

Following the pattern of every new development, early large scale computers gave rise to the usual trials and tribulations. The time has now been reached, however, when it can be said that computers do, in fact, "compute."

It has been said that computers have improved 10 to one each year for the past few years. This would mean that they are now one million times as good as six years ago. This may be somewhat of an exaggeration but does illustrate the extremely rapid tempo of new developments in the computing machine field.

POSSIBLE USES FOR DIGITAL COMPUTERS AND RECORD KEEPING MACHINES

1. Small, medium, and large repetitive engineering calculations.

2. Special engineering and scientific calculations.

3. The preparation of handbook data.

4. Data reduction. Correcting test data to standard conditions and the conditions and the interpretation of results.

5. The automatic reading, recording, and reduction of test data. Systems are now being developed for feeding test values directly into computers, without human observers.

6. System analyses. For example, the determination of the optimum compressor pressure ratio for a jet engine.

7. Weight control in aircraft design.

8. Statistical studies.

9. Traffic control in cities.

10. Highway planning.

11. Indexing library data for ready reference. For example, a comprehensive index of all the technical information on computers and their associated mathematics.

12. Inventary control.

13. Production control. What to manufacture, and when, to meet a frequently changing production schedule.

14. Piecework price setting.

15. Manufacturing cost estimates. (For special products built largely from standard components, such as many industrial products.)

16. Economic studies.

17. Management reports. Reports the first day of each month for the preceding month.

18. Payroll compilation and check writing.

19. Manufacturing operations scheduling. Consolidation of different lots in a job-shop type of manufacturing operation to minimize setup costs and increase output.

20. Personnel records.

21. Automatic control of machine tool operations.

22. Business forecasts and the preparation of budgets.

23. Scheduling the manpower and output for an operation.

24. Planning industrial production during national emergencies.

The following is a description of a computer about 10 times as good as present-day models with respect to computing speed and internal storage capacity:

1. Form of input and output: 10 decimal digits and/or alphabetical characters.
2. Computing speed: 100,000 ten digit additions or subtractions per second; 20,000 ten digit multiplications or divisions per second.
3. Internal storage capacity: 10,000 to 20,000 10 digit numbers. (The program, i.e., sequence of individual operations, for solving a problem is stored internally as well as all numbers used in the problem.)
4. External storage capacity: Unlimited storage in a magnetic tape library; one million or more 10 digit numbers available to the computer without human intervention.
5. Machine errors: About one per billion operations.
6. Probable cost of the 1954 or 1955 model: $200,000 per year rental (including maintenance); $500,000 to $1 million purchase price.

The author feels that each computing machine application must be considered as a special case. This is so for two reasons:

1. To lease or buy computing equipment requires a sizable outlay of money.
2. After a computer is available, each user must, for the most part, develop his own techniques for using the machine.

Keep it Busy

The crux of the computing machine problem is personnel. The cost of a computing machine itself is a small part of the total cost of making calculations. A machine of the type described in this paper might easily be able to solve as many problems as 200 or more people could program. Even on a highly repetitive job such as heat balances, a good computer, working full time, could make more calculations than a score of engineers could digest. On non-repetitive work, the ratio of man hours to machine hours would run much higher.

This brings up the question of the organizational setup for using a computing machine. Two possibilities present themselves:

1. A decentralized setup in which the computer is available to each engineer for solving problems which he, himself (with or without the help of assistants), has programmed.
2. A centralized computing group to whom engineers bring their problems for solution.

Probably a combination of the two is best. The author's feeling is that an engineer being pushed for the solution to a problem will take more interest in solving it than will a "professional" calculation group. Many times, however, the mathematics of a problem will be beyond the know-how of an otherwise good engineer. The central group should also lead in the development of new calculation techniques such, for example, as the development of programs for evaluating the properties of steam, solving differential equations of the types needed in the particular computing machine application, and so forth.

In the author's company, the new IBM 701 computer (AUTOMOTIVE INDUSTRIES, May 1, page 36) will be used to solve a large variety of engineering problems. These will include various kinds of stress and vibration problems, theoretical nozzle and bucket design studies for turbines and compressors, power plant cycle studies, and many others. In fact, every long or involved calculation procedure, as well as many short but repetitive ones, will be considered as potential problems for automatic computation. Their companion product, record keeping machines, are distinguished from calculating machines in that they are designed for large amounts of input, output, and storage with relatively little calculating while calculating machines are designed for smaller amounts of input and output but larger amounts of computing.

Digital computers are available in a large range of sizes to suit various problems and pocketbooks. Electronic computers with magnetic drum storage (or its equivalent) may be purchased for approximately $40,000 to $50,000 and up. At the present time, several makes of computers are available with approximately one-tenth the speed and one-tenth the internal storage capacity of the 1954 or 1955 model imagined by the author. These present day machines lease for about $200,000 per year or may be purchased for half a million to a million dollars.

Steps to Take

In order to determine whether a digital computer would be economical:

1. Consider the calculation (or record keeping) problem itself.

Is it large or small? If it is small and present methods are giving satisfactory results, automatic calculation will probably not be profitable.

How might machine calculation pay for itself? By solving a wider variety of problems than are now being solved? By making a larger volume of calculations? By completing calculations at an earlier date? By decreasing computation costs? By giving more decimal digits of accuracy? By decreasing numerical errors and procedural errors?

How will the above be converted into profit dollars in the profit and loss staement? By improving the product and reducing complaint expenses? By decreasing the cost of the product? By better customer service and increased sales? By speeding up developmental work through using calculated values instead of engineering estimates in design work? By applying design theories which are not practical without automatic computations?

2. Consider how the problem can be organized for automatic computation.

What will the input quantities be? At what point will the computer start the problem? Where will it end?

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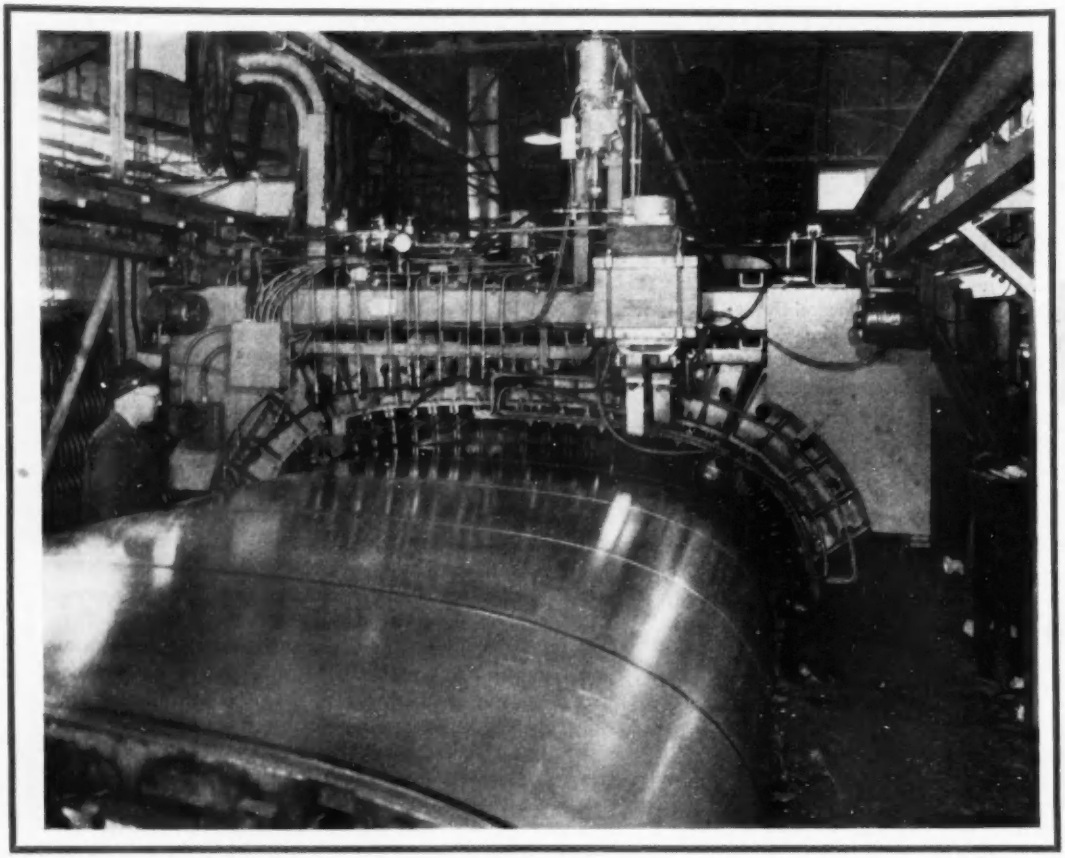


View of the Progressive multi-spot welder for making up bus body roof assemblies. It is arranged in an automatic cycle to complete a double row of 50 spots each at each seam along the roof.

Mass Production Techniques

BEGINNING its 31st year of service, Superior Coach Corp., Lima, Ohio, has been building on the average 5000 school buses a year, and around 1000 ambulances and funeral cars on Cadillac chassis. This production includes the contribution of the new Mississippi plant which recently completed its first full year of operation. The latter plant now is equipped to produce ambulances and funeral cars on Pontiac chassis to supplement Cadillac production in Lima.

Sprawling over 88 acres of ground area, the Lima plant has about 360,000 sq ft of productive floor space under cover, with over two miles of assembly lines.

Mindful of the need for progressiveness in increasing its service and furthering manufacturing economies, the company has been expanding its facilities in recent years and has made a considerable outlay in capital investment for tooling and mechanization, and for improvement in processes. When basic bus body design changes were introduced recently, the company seized on the opportunity to redesign some of the major tooling, particularly the framing fixtures. These framing fixtures now are so designed as to accommodate the gamut of variations in sub-assembly lengths and widths in a single fixture. Although such fixtures are more expensive and more complex, they simplify assembly and welding operations, and what is still more important their introduction released considerable productive floor space for other urgently needed assembly lines.

A study of the manufacturing setup is of general interest in view of Superior's success in adapting mass production techniques to relatively moderate volume requirements.

Craftsmanship of the order of custom body building is an essential in this operation, particularly in the manufacture of the beautifully painted and specially trimmed ambulances and funeral cars. This is exemplified in the toolroom with its impressive facilities for

Close-up of the new framing fixtures for bus body side panel assemblies. The two fixtures, handling right and left sides at the same time, have provision for accommodating 14 different lengths of side panels.

Applied to Building BUS BODIES

By Joseph Geschelin

making press dies, framing fixtures and tools as well as the building of experimental parts and sheet metal assemblies. Outstanding among the toolroom equipment is the P & W Keller machine which is capable of handling the really outsized dies for making some of the largest stampings in the industry—one-piece roofs for Cadillac ambulances and funeral cars, and rear body stampings for school bus bodies.

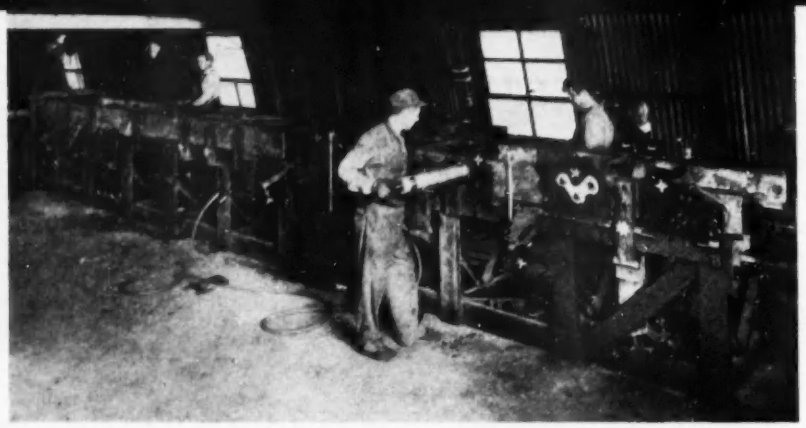
The press shop, housed in a separate building, produces all of the stampings used in this operation, and is a self-contained establishment fully equipped with its complement of presses, square shears, press brakes, and other sheet metal working machinery. Among this equipment are some modern Cincinnati square shears and Cincinnati press brakes, the latter being illustrated.

Most of the stampings are produced on two large hydraulic presses—a Lake Erie and an H-P-M. The H-P-M hydraulic press is capable of handling the largest dies such as for the one-piece roof stamping, and the school bus body rear section. Illustrated here is the H-P-M set up with progressive dies for making bus doors, producing a door with each stroke.

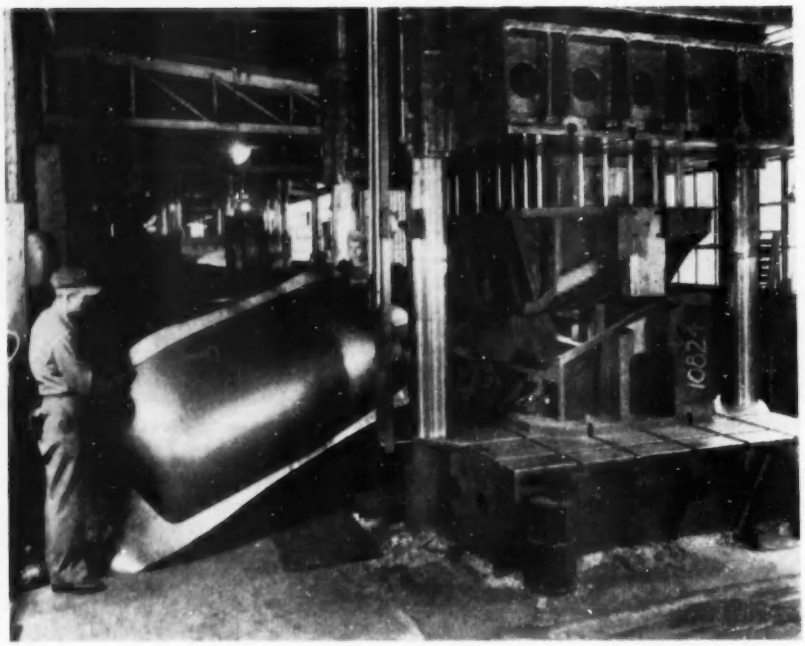
Die equipment is available in various forms in keeping with the nature of the work as well as production volume. Thus cast iron dies are used for long run parts; Kirksite for short run parts; and some wood dies for small runs and experimental jobs.

New methods are being explored constantly. For example, the company is currently starting experimental runs with a new Rezolin plastic die made by Creative Industries of Detroit.

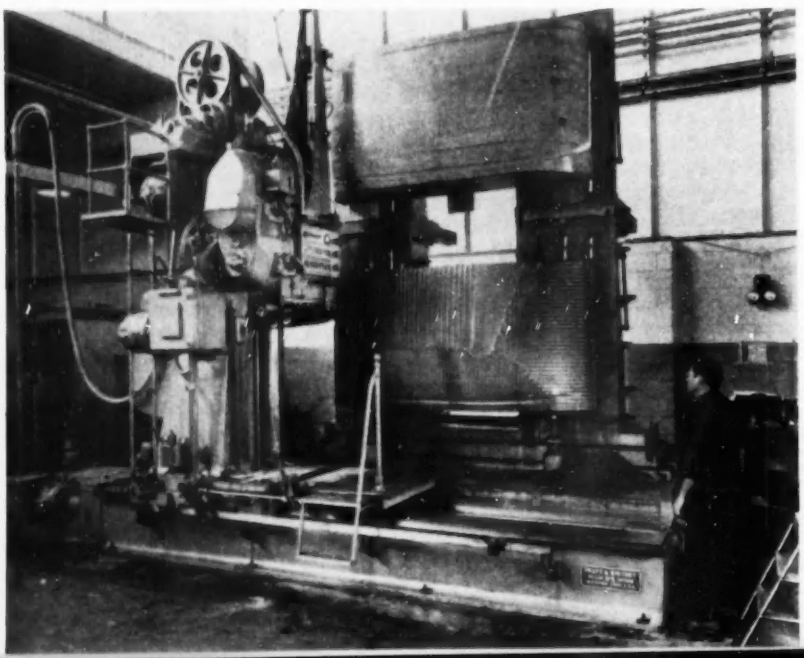
The bus body line typifies advanced practices. One example, illustrated here, is the framing of side panels in the new fixture which is designed with suitable



Here is a line-up of heavy duty, long bed, Cincinnati press brakes which are used for a variety of operations on the various stampings.



View of the press bed of the Lake Erie hydraulic press, one of the major items of equipment in the Superior press shop. Here may be seen in the drawing of one of the large stampings, using permanent cast iron dies. The press itself towers upwards out of the illustration.



adjustments to accommodate 14 different lengths of side panels as well as expansion in height.

Another noteworthy example is the multi-spot welder for framing school bus roof panels. As illustrated, the welding head has a series of 50 guns along the arc, has an automatic cycle to index the head for producing a second set of 50 spots along each seam. In addition, it has eight guns forward for another group of spot welds.

Since the standard line of school buses is mounted on chassis supplied by a number of different truck builders, Superior has a separate department for chassis preparation. Its function is to modify the chassis, according to specifications — by lengthening wheelbase, aligning cowls, and by the addition of body brackets.

Special framing fixtures of massive construction are provided for making up the major sub-assemblies such as the rear end assembly, the complete funeral car and ambulance body, underbody, etc. The underbody fixture is of horizontal type with automatic air-clamping at all points. The framing fixture for funeral car and ambulance bodies is very much like those used in mass producing passenger car bodies.

Superior also builds a line of "pusher" type or rear engine drive school buses on a chassis of its own design. The smaller

Pratt & Whitney Keller machine is the most impressive of the equipment in the tool room. Seen here is the Kellering of a bus roof section die, with the wood master shown at top of picture.

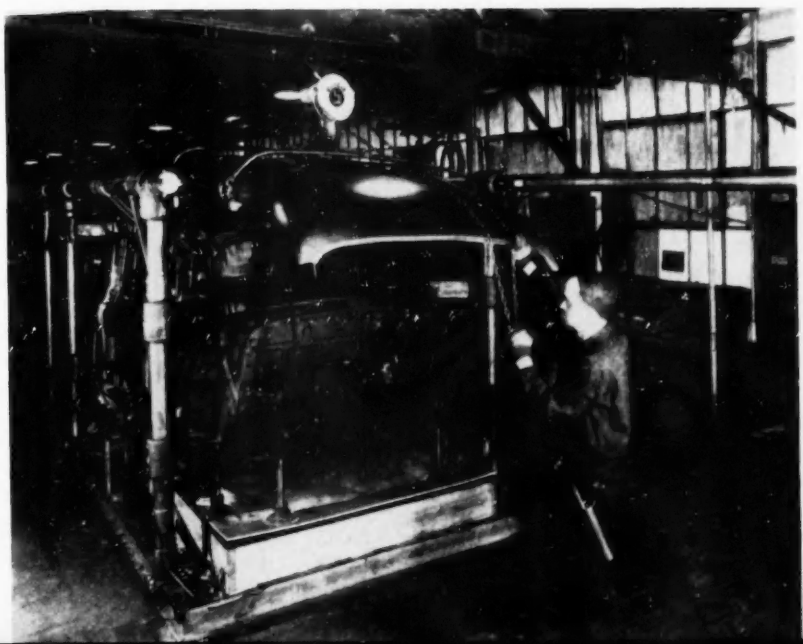
model uses an IHC "Red Diamond" engine; the more recent, larger capacity bus employs the big LeRoi V-8. These chassis are built in a separate department. One of the noteworthy features is the massive framing fixture for producing the chassis frame. As illustrated, the high tensile steel side rails and cross-members are installed in the fixture in preparation for drilling all attachment holes. Drilling is done with the use of hinged type jigs which are locked securely to the rail at the start of the operation. For drilling, the operators use the special Keller gun drill, shown in the photograph, fitting the end of the gun into the jig bushing. It is also noteworthy that most of the fastenings are made up with large Huck blind end rivets, the remaining few being hot riveted.

Painting is a major operation at Superior what with the relatively large volume of buses and cars produced here. Bus bodies are painted in large booths installed by R. C. Mahon. A feature of these booths is the provision of small water back panels in the front wall of the booth, provided with an exhaust system for removing overspray and fumes.

The Lima plant is a beehive of activity this time of the year, filling its heaviest demand for school buses for the 1953-54 school season all over the country. Needless to say, the operation employs a profusion of materials handling devices.

Interior of the "pusher" bus chassis framing department. Shown here is the massive fixture for holding side rails and cross members in accurate alignment during drilling and riveting operations.

This is the long bed H-P-M hydraulic press, used for a variety of stamping operations, particularly for the production of extremely large parts such as one-piece roofs for special Cadillac bodies. Shown: progressive die setup for making bus doors.



This is the massive master framing fixture for integrating Cadillac funeral car and ambulance bodies. Its familiar appearance links it with similar fixtures used in passenger car body plants.

Design Characteristics of Fully Automatic Transmission for Fork-Lift Industrial Truck

A NEW automatic transmission that makes it possible to operate a gasoline engine powered fork-lift truck with three simple controls—an accelerator, a brake pedal, and a forward-reverse selector lever—has been announced by the Clark Equipment Co., Buchanan, Mich. Known as the Hydratork Drive, the factory-installed unit is currently being produced for Clark's Utilitruc line of fork-lift trucks in the 6000-7000 lb capacity range. The new drive is not and will not be available for field installation. It will, however, be available for both lighter and heavier truck models as soon as production facilities can be expanded.

Basically, the Hydratork Drive consists of a torque converter combined with a simplified single-step, constant-mesh, forward-reverse transmission. The torque converter is a standard single-stage, two-phase, three-member unit, and consists of an impeller, stator and turbine. The impeller, which acts as the outer shell of the converter, is bolted directly to the flywheel and turns at engine speed. To start the load, the torque converter adds its multiplying force to the fixed gear reduction of the transmission and drive axle. As the vehicle approaches cruising speed, torque multiplication drops to zero. With this arrangement, high and low gears, gear shift, clutch and clutch pedal are eliminated.

Power from the torque converter is transmitted to a one-piece, automotive-type main drive shaft-gear. The main drive gear, which rotates in the same direction whether in forward or reverse, is in constant mesh with a primary forward and a primary reverse countershaft gear. Each of the primary gears is a one-piece spool gear mounted with a bushing on the respective countershaft. One end of the gear has helical teeth which mesh with the main drive gear; the other end has straight teeth which act as a mount for a series of five disks, each with a hole in the center. Teeth on the inner rim of the disks fit between the straight teeth of the gear. The disks are free to move parallel to the axis of the gear, but are constrained to rotate with the gear. Since the primary gears are mounted on bushings, they can turn or spin freely on their countershafts when activated by the main drive gear.

Secondary forward and reverse gears are splined to the respective forward and reverse countershafts. Each of the secondary gears is a one-piece unit in the shape of a drum with a flange or lip. Each gear is positioned on its countershaft so that it encloses that portion of the primary gear upon which the disks are mounted. The secondary gears are in constant mesh with each other through helical teeth cut along the periphery of the flange or lip. Straight gear teeth, along the interior surface of the secondary gears act as mounts for another series of disks.

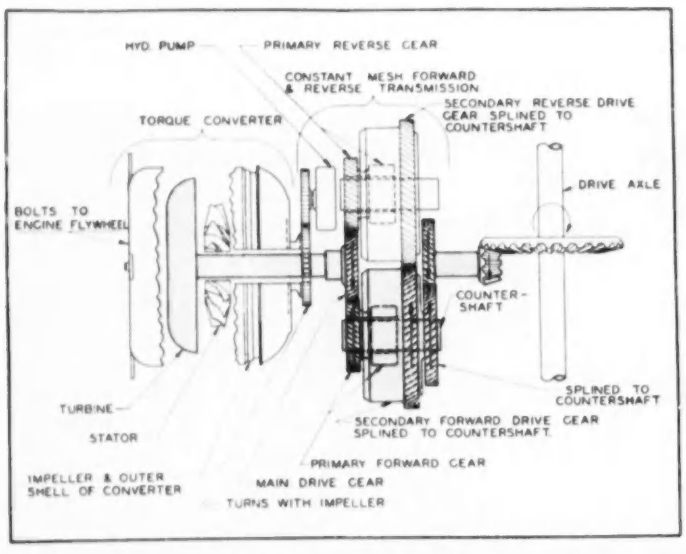
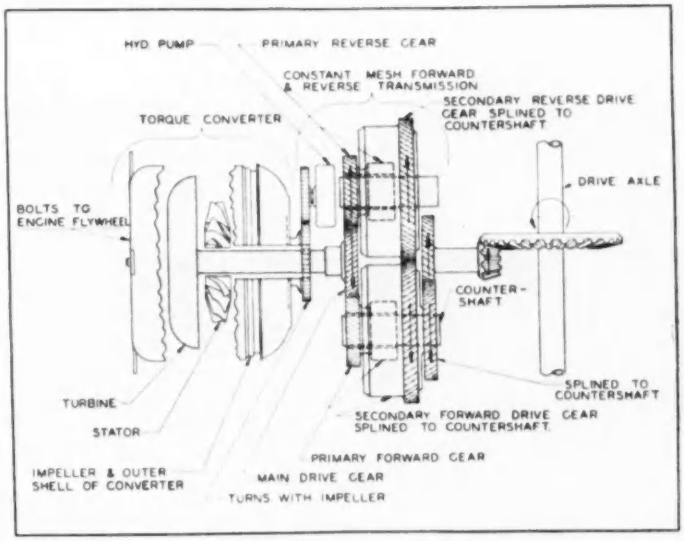


Diagram of Hydratork transmission in operation for forward motion. Shaded area indicates gears and other units that are under power.



Hydratork transmission with reverse engaged. The primary forward gear, shown in white, is turning free. Gears under power are shaded.

These disks have teeth cut along the outer periphery which fit into the grooves formed by the interior straight gear teeth of the drum-shaped secondary gears. The disks are free to move along the grooves, which are parallel to the countershaft axis, but are constrained to rotate with the secondary gears.

The disks of the primary and secondary gears are positioned so that a primary gear disk alternates with a secondary gear disk. The disks are kept apart by a series of springs between the disks.

Not all of the interior surface of the drum-shaped secondary gears has the straight gear teeth. A portion of the surface is ground to receive a piston, so that the drums can act as hydraulic cylinders.

To sum up, the forward and reversing mechanisms are duplicate sets of gears, each set consisting of the following: a primary spool gear riding freely on its countershaft, one end meshing with the main drive gear and the other end acting as a mount for five disks; a secondary drum-shaped gear, splined to the countershaft, with external helical teeth meshing with its "twin," and with internal teeth which act as a mount for five disks; and the disks of the primary and secondary gears of a particular set alternating and kept apart by springs. The disks are free to move parallel to the axis of the countershaft but constrained to rotate with the respective mount, i.e., the spool gear or the drum-shaped gear.

There is one additional gear, termed the selector gear, which is splined to the countershaft of the forward gear set. It is in constant mesh with the pinion shaft which drives the ring gear on the drive axle. For proper balance and dimensioning, since it does not have the selector gear, the countershaft of the reversing gear set has a spacer splined in place of the selector gear.

Up to this point it will be noted that when the main drive gear rotates, only the primary forward and reverse gears with their disks rotate. The gears are not splined to the countershafts, so the countershafts, and therefore the secondary forward and reverse gears and disks, the selector gear, pinion shaft and drive axle, remain motionless. In effect, the transmission is in neutral. Before any motion can be transmitted to the drive axle, it is obvious that the primary gear must be coupled with the matching secondary gear.

The Hydratork transmission is activated by a simple hydraulic system. To move a Hydratork-equipped forklift truck forward, the driver flips a direction selector lever, located on the steering column under the steering wheel, to the forward position. This directs a stream of hydraulic fluid, under 80-90 psi pressure, through a hole in the center of the forward countershaft. The fluid flows into the drum-shaped secondary forward gear and activates a piston which forces the disks of the secondary gear and the primary gear together, and against a heavy backing plate. In effect, the primary and secondary forward gears are now engaged and turn as a unit.

Since the secondary gear is splined to the countershaft, the rotation of the main drive gear is transmitted through the engaged primary and secondary forward gears to the countershaft. As the selector gear also is splined to the shaft, it too rotates and, in turn, activates the pinion shaft which transmits motion to the ring shaft on the drive axle—and the truck moves forward.

During this interval, the primary reverse gear is spinning freely. Also, the reverse countershaft and secondary reverse gear are rotating, since the secondary reverse gear is in constant mesh with the secondary forward gear. However, as the disks of the primary and secondary reverse gears are not engaged, the motion of the primary gear is independent of and in the opposite direction to, the secondary gear.

To reverse the truck, the driver moves the direction selector lever to the reverse position. This activates the piston in the secondary reverse gear to engage the primary and secondary reverse gear disks. Motion is now transmitted from the main drive gear through the engaged primary and secondary reverse gears. Since the secondary reverse gear is in constant mesh with the secondary forward gear, the latter is also activated. However, the secondary forward gear now rotates in a direction opposite to that imparted by its primary during forward motion. This reversed rotation is transmitted to the forward countershaft to which the forward secondary gear is splined. The

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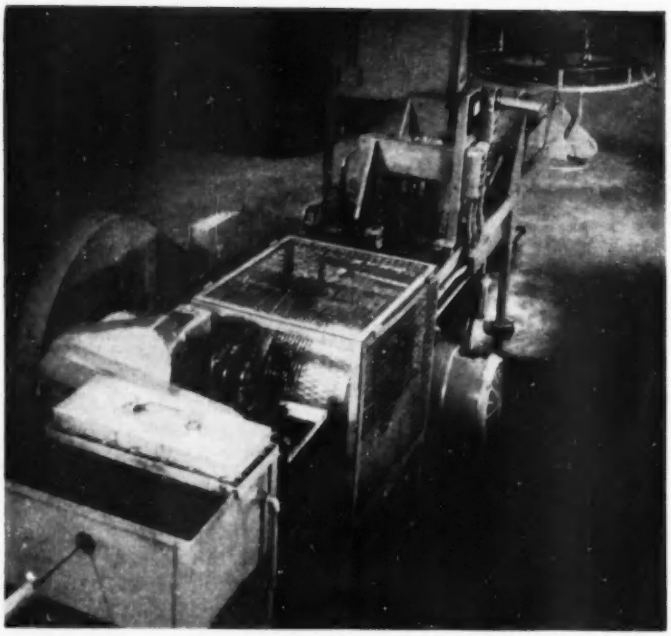
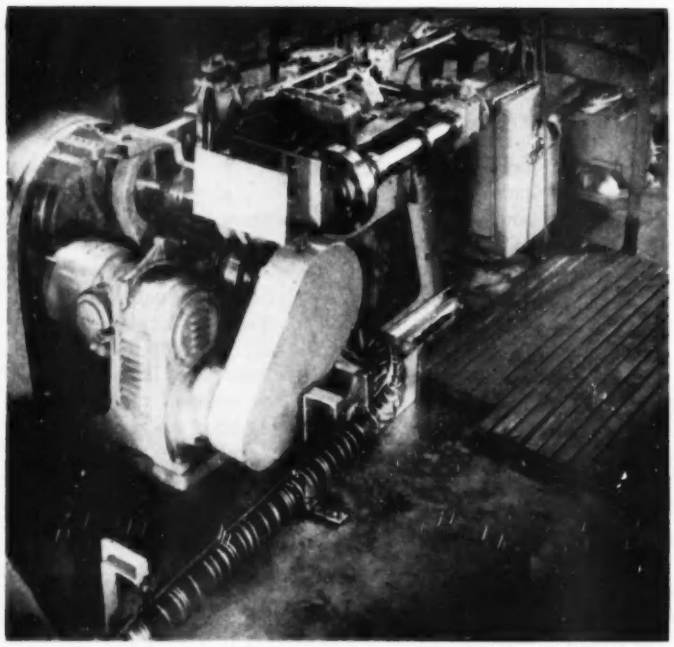
Advanced Methods for Making STEEL PISTON RINGS



Perspective of Fenn rolling machine which takes round carbon steel spring wire rolls it into rectangular section, and rolls two oil grooves in one face.



This is the U. S. Multi-Slide coiling machine arranged for coiling the rectangular wire into circular form and cutting it off.

LATEST developments to issue from the Diesel Equipment Division, General Motors Corp., Grand Rapids, Mich., is a chromium-plated steel piston ring, now being produced in quantity for Detroit Diesel "71" engines. Four of these rings are employed per piston as compression rings.

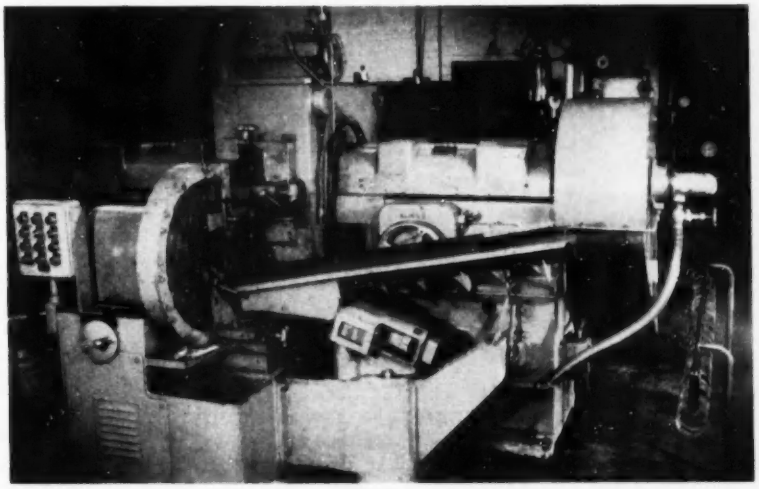
Articles on the production facilities of this company have appeared in AUTOMOTIVE INDUSTRIES at various times, starting initially with the manufacture of fuel injection equipment for GM Diesel engine divisions; then following with the introduction of hydraulic valve lifters for Cadillac, Buick, Olds, Chevrolet. At the present writing the company is producing valve lifters at the rate of some three million per month.

The enormous growth of this company, incident to the introduction of new products, including fuel nozzles for jet engines recently, has resulted in a major plant expansion, the present productive floor space being close to 500,000 sq ft.

Steel piston rings are being produced in a self-contained area in one corner of the plant, using advanced methods and equipment in a rather unique and noteworthy setup. At this writing the setup is quite modest in size, in keeping with volume of production. It is safe to say that the department will be expanded considerably as time goes on.

The operation begins with round, carbon spring steel which is fed automatically from a coil into a Fenn rolling machine. Here the round section is

By Joseph Geschelin



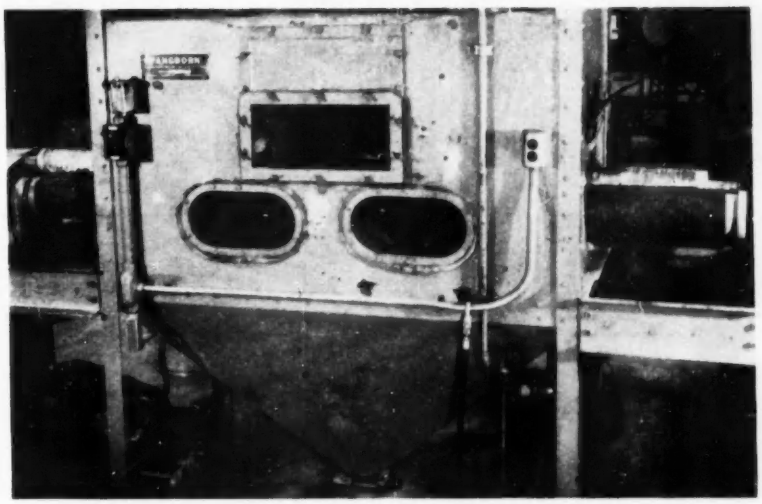
Large double-end Gardner grinder which has been tooled for finish-grinding the sides of piston rings. As seen here rings are fed to the machine on the chute in the foreground. Rings are picked up and loaded automatically into the dial feed mechanism which feeds them to the work station one at a time. Finish-ground rings are automatically unloaded and delivered on feed rail at extreme right.

is rolled into rectangular shape and, at the same time, two oil grooves are rolled in one face which later becomes the OD of the ring.

The rolled section then goes to a U. S. Multi-Slide coiling machine where it is rolled into circular form and cut off.

The next operation is the most critical and is responsible for the behavior of the ring in an engine. This is the process of heat forming to provide the desired ring pressure pattern. To this end the coiled rings are stacked on an arbor which has the form of a master cam. The rings are pressed tightly in place by means of an outer cover so as to conform to the arbor during heating. Then the loaded arbors are put through a Lindberg furnace for the heating cycle.

Following heat forming the rings are fed to a large double-end Gardner grinder to grind both sides simultaneously. For this operation the rings are fed to an indexing wheel, as illustrated, then stripped off one by one as the work approaches the grinding station.



Prior to chromium-plating the OD of rings is grit-blasted in a Pangborn cabinet, the rings being stacked on a long rotatable arbor for this operation.

After grinding the rings are stacked on an arbor and honed on the OD, using a honing tool incorporating abrasive sticks on the inner diameter.

Rings now are ready for gapping. This operation will be handled in production by grinding as soon as the equipment is available.

Rings again are stacked on arbors and are grit-blasted in a Pangborn cabinet.

Final major operation is chromium plating. The process employed here stems from considerable experimental development and has some distinctive features. For one thing it produces a long-lived hard chromium plate. What is outstanding is that they plate about 0.007 in. thickness in a cycle which takes only three hours.

After plating, the rings are stacked once more on arbors and are given a finish-hone to remove some of the chromium plate and to produce the required diameter. All rings are given a final inspection to assure acceptance.

Cutting Abrasive Costs in Body Plant

By J. R. O'Neil, Sales Engineer
Coated Products Div.
THE CARBORUNDUM CO.

and

W. J. Swallow, Plant Manager
Buffalo Assembly Plant
FORD MOTOR CO.

THE use of coated abrasives in the automotive industries has grown so rapidly in recent years, that direct abrasive costs for body assembly operations alone are today estimated in excess of $10 million per year.

Coated abrasive techniques are particularly well suited to high production rate, assembly-line production. The ability to carry the tool to the work and the rapid rate of cut are two outstanding features whereby coated abrasives lend themselves, generally, to operations where high labor and overhead costs prevail.

It is highly desirable, therefore, to take advantage of the features offered by coated products in order to obtain maximum efficiency at lowest cost.

The most substantial reductions in abrasive costs can be obtained—as has been accomplished by the Ford Motor Co.—through control of waste and proper application of the abrasive.

Of the two, waste control has been productive of the greatest savings. Waste involves a number of factors, including incomplete abrasive consumption, careless handling, inefficient application, improper storage precautions, etc.

Most of these elements can be overcome by establishing personal control over this phase of plant operations. For example, some plants assign an industrial engineer to the task of overseeing the consumption of nonproductive items such as abrasives, buffs, etc. The engineer, working closely with supervisory plant personnel, establishes budget quotas of the amounts of abrasive materials to be issued to the various departments. This measure has the effect of focusing attention on wasteful practices in a rather forceful manner, with the result that material costs soon drop.

Removing dimples, pimples and other surface imperfections with a resin sander disk. The operator is using a flexible backing pad so as to maintain the body contour.

Storage of coated abrasives is also important, costwise, particularly with the so-called glue bond products, which are more susceptible to changes in humidity than resin bonded materials.

It is only natural that changes in relative humidity will cause some shape change to occur, as well as influence productivity; hence, for best results, storage conditions should be kept as close as possible to 70 F and 50 per cent relative humidity. In some industries, controlled atmosphere rooms have been

set aside for storage of coated products. This is also a matter of economics, and to be practical, should involve the storage of other materials affected by humidity changes.

Moreover, when coated abrasives are used improperly or inefficiently, or for applications other than those for which best suited, these factors should likewise be considered as forms of waste.

The means of overcoming the latter problem lies, of course, in proper application and proper abrasive selection. The following text discusses a number of coated abrasive products, their applications and pertinent facts concerning their proper use, in operations performed in automotive assembly plants.

The most widely - used coated abrasive product employed in the automobile assembly body shop, in terms of dollar volume, is the sander disk.

Speed of the abrasive disk is very important. When operated at excessive speeds glazing is encountered with normal pressures, and if speed is very high, chipping may result. On the other hand, too slow a speed causes a loss of efficiency insofar as rate of cut is concerned.

For a nine in. disk, the recommended speed is 4250 rpm (no load), and for a seven in. disk, 5400 rpm (no load). Both speeds are available in standard portable tools. In general, maximum efficiency is obtained at 8500 sfpm.

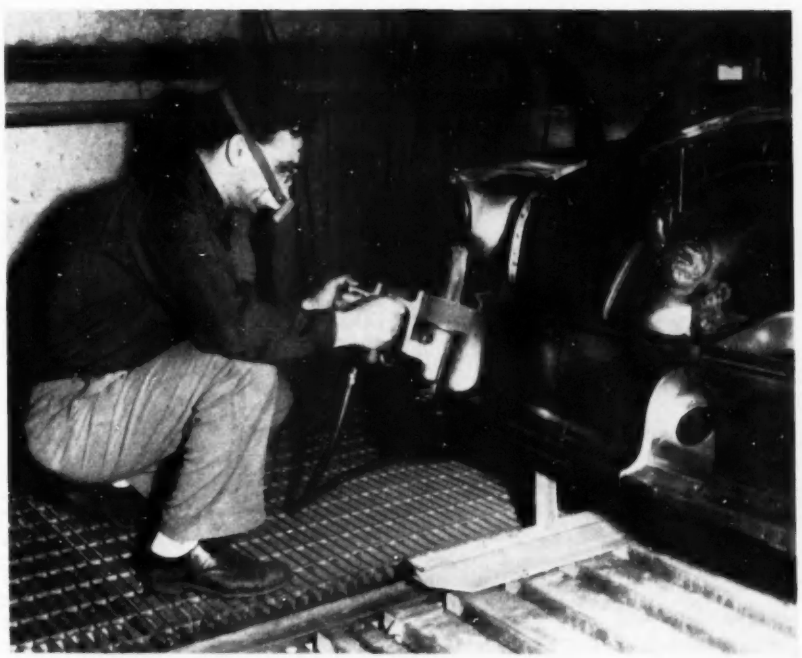
To achieve the greatest economy of operation, disks can be cut down successively from nine in. to five in. in the course of use. Continued maximum efficiency can be attained if disks are cut down before the edge is completely glazed. For example, should a disk, that could be extended to finish six welds before becoming smooth, be cut down after four welds, the maximum cutting efficiency would be retained.

Usual practice is to cut down the disk in one-in. steps (in diameter), but where the area of contact is wider, cuts may be made in two-in. steps; that is, nine to seven and seven to five. When small work radii are to be sanded, such as door facings, disks may even be cut down to three in. in diameter. Disks are cut down with rotary cutters or with small stamping presses.

Another method of extending the life of sanding disks, where excessive loading is found, as in solder sanding, is the use of lubricants and grease sticks.

Disk life can also be prolonged through the use of worn or discarded wire brushes. When the efficiency of the disk has been reduced, due to loading, it is brought into contact—while still rotating—with the wire brush. The metal chips are thereby removed from the disk and it is ready for additional service.

On the basis of laboratory and plant evaluation tests, it is found that for general-purpose work the resin sander disk is to be preferred to the glue bond product. This is due to the greater resistance of the resin bond to changes in humidity and the ability to withstand heat produced in grinding. In certain instances, however, particularly where extremely soft solder is encountered, open coat glue bond disks have proved most successful because chip clearance is provided.



Sanding solder seams under rear tail-lights with a Buckeye belt sander. When used with slack-of-belt, the tool permits the body contour to be followed.

An important consideration in the application of sander disks is the proper selection of a companion sanding pad. To meet the hard use and punishment usually encountered in general body shop use, Carborundum has designed a sturdy, rugged pad. It is available in tapered form (varied thickness across the radius) for uses where flexibility is desired, and comes in five, six, seven, eight and nine-in. diameter sizes. For flat work applications, a straight type of pad is provided, in seven and nine-in. diameters.

Another pad, intended for light-work requirements,

Removing orange peel from the prime coat below the deck-lid area with an oscillating sander.

is also available, in one-in. increments, ranging from four in. to nine in. in diameter.

In most cases, it is best that the pad be as close to the size of the disk as possible—considering the area that is to be sanded. This will hold flexing between the disk and the sander pad to a minimum and will increase the life of the disk. At times, however, this general rule must be modified somewhat due to the particular body component being sanded and its shape.

In the sanding of welds and body burrs on flat surfaces, the MX depressed center wheel has been found to be most satisfactory and economical. This new product consists of a reinforced, laminated abrasive material molded into the shape of depressed center wheels and disks. It has the outstanding advantage of not leaving a burr. In surfacing windshield burrs, rear window openings, body burrs, etc., a 7 by ¼ by ⅞ in. depressed center wheel, grade A24RFX2, outperforms conventional sander disks by a wide margin.

Two new products that have found numerous applications in the automotive body shop are the Flexbac pad and the Fastcut pad.

The Flexbac pad consists of a sponge rubber disk ¾ in. thick, attached to a conventional seven in. sander pad. The abrasive disks are held to the face of the rubber pad by means of a pressure-sensitive adhesive.

Due to its cushion-type, resilient rubber pad construction, the Flexbac pad sands contours better than any other mechanical tool, because it follows convex and concave curves in a car body with ease. Moreover, the pressure-sensitive adhesive permits easy removal of disks.

The pad finds widespread application in the dry sanding of re-run hoods, fenders and repair work. In some cases it is used for wet sanding as well, although the Fastcut pad (discussed later in more detail) is generally preferred because of a more aggressive action. In dry sanding, 240 grit silicon carbide waterproof paper, 8¾ by 0 hole, is recommended. This grit size may appear somewhat coarse, but the action of the pad is such that the resultant finish is highly satisfactory.

A typical application is the dry sanding of dip-primed fenders, using a Red-I-Cut 220 grit paper disk in conjunction with the Flexbac pad. Performing the sanding operation dry enables the operator to follow his progress more readily.

In the repair shop, the Flexbac pad is unsurpassed as a feather edger. No point pressure is developed during use, and a feathered-edge is obtained even if the paint is sanded through to the metal. This method has proved so satisfactory that it is used in repairing enamel.

The Fastcut pad is similar in construction to the Flexbac pad, except that the pad is of slightly harder rubber and therefore produces a more aggressive grinding action. The pad face takes an eight-in. paper disk and the backing sander pad is five in. in diameter.

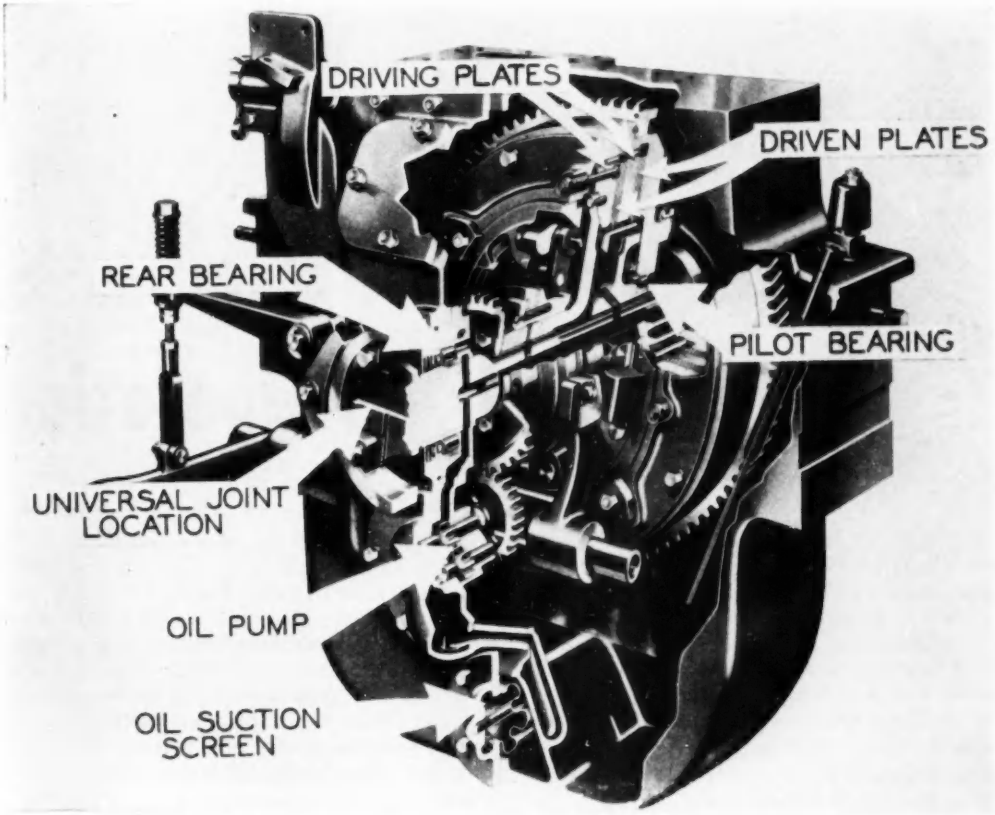
The recommended procedure for using the Fastcut pad is to adhere a waterproof paper disk, usually 320 grit silicon carbide, to the surface and to sand the prime coat wet, using a slow speed, 1500 rpm air tool. To get water to the job, for wet sanding, a ¼-in. line, equipped with a thumb valve, can be attached to the tool.

Another application of the Fastcut pad is in highlighting metal and blending of disk marks after disking operations. The abrasive material recommended for this use is 40 grit aluminum oxide (electrocoated) metal cloth, 8 by 0 hole.

Belt sanding machines of various types have been used in the body shop for a number of years. Of recent design is the Buckeye belt sander developed for use on solder sanding. One model, which takes a 25½ by two in. belt, has no platen, and is generally operated on the slack-of-belt. Another model takes a 33½ by two in. belt and is usually employed using the platen as a working surface.

Resin belts are used, in some cases, in the sanding of solder seams with the Buckeye sander, but the glue-modified, industrial cloth belt has proved most

(*Turn to page* 100, *please*)



Cutaway of a model of the oil-type flywheel clutch which has been introduced as standard equipment on Caterpillar's D6 tractor and No. 6 shovel. A larger type clutch of similar design has also been made standard equipment on the Cat D8 crawler tractor.

Caterpillar Develops Oil-Type Tractor Clutch

An oil-type clutch, said to be the first unit of its kind in the crawler tractor field, has been introduced by Caterpillar Tractor Co. on three of its track-type machines. It is now standard equipment on the Cat D8 and D6 tractors and the Caterpillar No. 6 shovel.

According to Caterpillar, the new clutch will operate two to four times longer than an equivalent dry clutch before major adjustment or overhaul is necessary and, under ordinary conditions, the overhaul period of the clutch should coincide with the normal overhaul of the engine.

Where the longer wear of this unit is particularly apparent is in the friction disks. When the clutch is being engaged, the oil absorbs the load up until the last few revolutions before full engagement at which time the friction faces finally come into direct contact.

In the closed clutch housing the pump lifts oil from the reservoir at the bottom of the housing and forces it through and around the clutch shaft in a continuous process. The oil is discharged around the inside diameter of the friction disks. It flows through the grooves and slots in the friction faces and pressure plates even when the clutch is engaged. The oil, ejected from the outside of the flywheel through radial slots, also provides constant lubrication for the cams, bearings and internal linkage.

Clutches on heavy duty tractors generate exceedingly high temperatures. The constant flow of oil through the clutch acts as a cooling agent and makes this unit particularly adapted to severe service and

(*Turn to page* 110, *please*)

Diamond T Tilt-Cab Requires No Power for Its Operation

Diamond T's Tilt-Cab models embody a new technique in cab-over-engine design. No essential change is made from the conventional engine, clutch, transmission, frame, axles and other major elements, which are standard Diamond T units. However, these units are combined into a full cab-over-engine vehicle, in which the cab, by a system of counterbalances, tilts forward for servicing without the need of a power unit of any kind.

The tilting action is effected without extra wiring and without "plumbing"—with practically no added moving parts. It is said that less than one minute is required for the entire cab, cowl, fender and grille assembly to be lifted completely clear of the engine area, which is opened up for unobstructed access to every part.

The basic design of the Tilt-Cab provides that controls are unaffected when the cab is lifted. A floor section with all pedals and steering gear remains stationary with the chassis The steering column and gear shift control shaft pivot on universal joints with fixed bases at the floor level. This development eliminates the hydraulic controls and special linkages that would be needed if controls moved with cab in tilting position.

The tilting procedure for the Diamond T Tilt-Cab is as follows: 1. Release the clamp lock lever on the back of cab. 2. Open door of bac and pull safety release knob inside cab. This pulls the hook back from engagement at the hold-down point. The safety latch cannot be released with door closed. 3. Lift gently on corner of fender and raise cab to tilt position (counterbalancing springs do the actual lifting). 4. Take

Diamond T Tilt-Cab Model 622C tractor. Note how chassis weight is concentrated on the front axle.

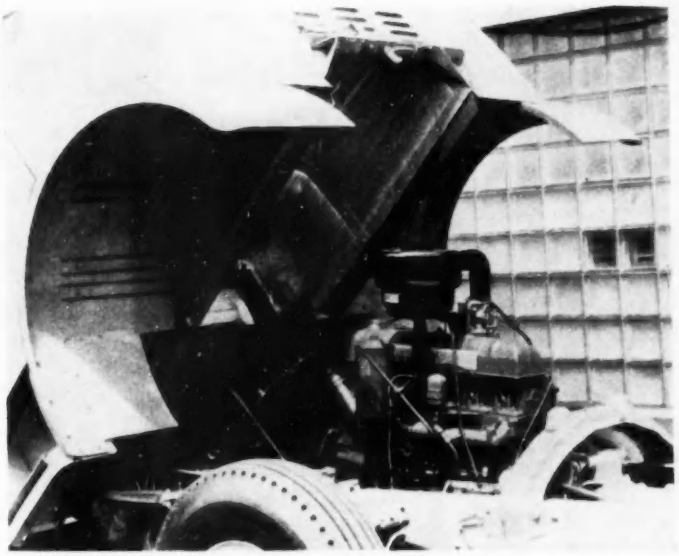
strut rod out of holding rack and place it in socket provided at frame. This is a safety feature to hold cab in tilt position.

First production of the new Tilt-Cab line will be in three series. Models 422C and 422CH cover the general range of city delivery service with GVW ratings from 17,000 to 22,000 lb, and tire sizes up to 9.00-20. The engine has a displacement of 271 cu in. and develops 112 hp at 3000 rpm.

For heavier loads and higher speeds on the highway, the larger 522C and 622C series provide GVW ratings to 26,000 lb and larger engines of 141 and 150 brake hp.

The springing system is a special feature, marking the first use in any commercial vehicle of progressive type "varirate" springs at both front and rear axles, according to Diamond T Motor Co. These springs are self-adjusting to the load, providing practically the same ride, loaded or empty.

This is accomplished by use of exceptionally long, deep cambered free-end springs. With light loads they contact the frame hangers only at the extreme tips. As load is applied, the springs flatten out and the effective length is reduced, with a proportionate increase in capacity. The contact face of the hangers has a cam-shaped curvature so that spring length and stiffness are always proportioned to the load. Leaf-type radius rods act as positioning members, and also absorb drive and braking torque reaction.



Left side of engine with cab tilted. The power plant, with all accessories, is well above the frame.

Front axles are heavier and of greater capacity in the Tilt-Cab line, to provide an ample safety factor for increased front-end weight. The heavy-duty Timken FC900 and FD900 series are standard, with extra wide track for maximum stability and short turning radius. The range of rear axles includes single-speed hypoid bevel drive models in several sizes and both Timken and Eaton two-speeds with electric shift.

Condensed Specifications—Tilt-Cab Line

	422C Series	522C Series	622C Series
Gross vehicle weight (lb)	17,000-22,000	17,500-24,000	18,000-26,000
Gross combination weight (lb)	35,000	40,000	45,000
Maximum tire size	9.00-20	10.00-20	10.00-20
Engine model	K-6271	K-6330	K-6363
Bore and stroke (in.)	3⅝ x 4⅜	4 x 4⅜	4 x 4 13/16
Piston displacement (cu in.)	271	330	363
Maximum torque (lb ft)	216	266	288
Brake horsepower	112 @ 3000 rpm	141 @ 3000 rpm	150 @ 3000 rpm
Front Axle	Tim. FC-900	Tim. FC-900	Tim. FD-900
Rear axle (standard model)	Cla. R-1000	Tim. H-100	Eat. 1790
Rear axle (H model)	Tim. H-100	Eat. 1790	Eat. 18500
Transmission	Warner T98	Clark 205V	Clark 205VO
Wheelbase range (in.)	99-159	99-159	99-159
Body lengths (ft)	10-20	10-20	10-20
Base chassis (lb)	6700	7100	7500

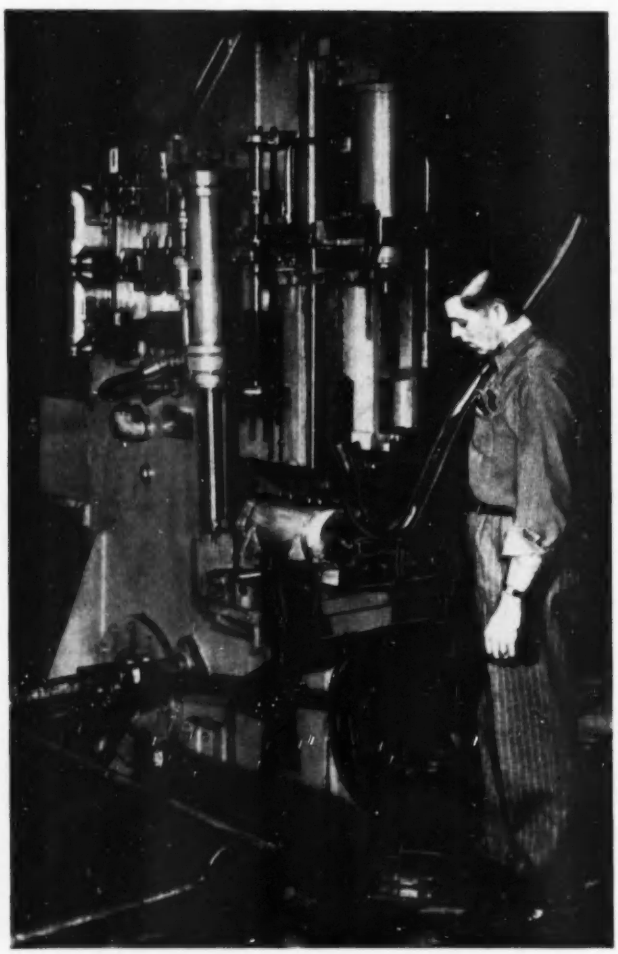
Forming Exhaust Pipes *with* Timesaving Equipment

At Maremont Automotive Products Inc., Chicago, a well-known automotive replacement parts manufacturer, a new hydraulic bending press now employed is producing exhaust and tail pipe bends at a production rate that is 50 per cent faster than has been achieved with any other press equipment. In addition, considerable savings are being effected in the cost of tooling and setup time, cut 33 per cent on the average job. The results described are obtained with a new, 20-ton vertical hydraulic bending press, designed and built by Pines Engineering Co., Aurora, Ill.

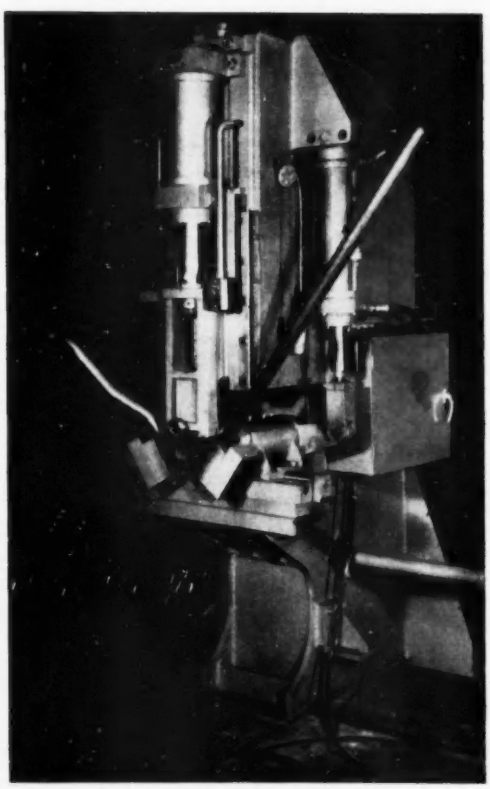
Most of the tail and exhaust pipes made at Maremont require a number of bends in different planes, and with ordinary equipment are difficult to handle on a production basis without employing a number of presses and different tooling setups. The new machine serves these forming problems by providing extra working clearance and fast automatic cycling which enables handling a much broader range of

(*Turn to page* 110, *please*)

New Pines 20-ton vertical hydraulic tube and pipe bending press installation showing side-mounted twin oil coolers, panel-mounted hydraulic valves, side-offset-mounted cushion, and 10-station automatic angle-of-bend selector turret. Adjustable bars at left are used for positioning workpiece for various planes of bends.



Right side view of the press. Note how wing dies are controlled by twin equalizing side-mounted cushions. Extra vertical clearance permits bending two in. OD tubes on a five-in. center-line radius to 180 deg.



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Schwitzer-Cummins Company, for 25 years the foremost builder of Positive Displacement Superchargers, now announces their latest engineering achievement, an Exhaust Driven Turbocharger with these outstanding features:

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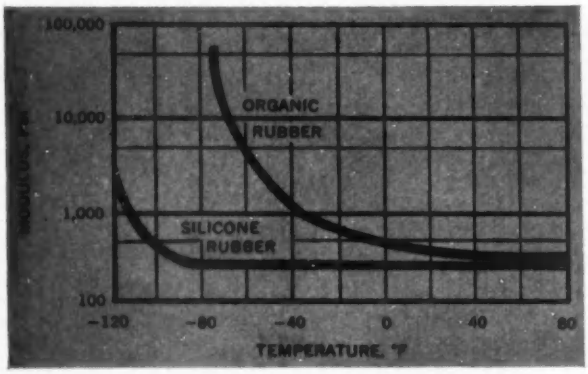
SE-100—IDEAL FOR ELECTRICAL AND MECHANICAL APPLICATIONS!

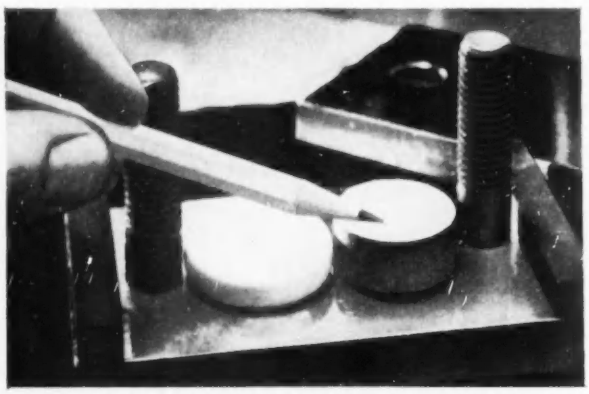
General Electric's new silicone rubber coating compound, SE-100, combines outstanding heat resistance, electrical and physical properties for a wide variety of electrical and mechanical applications. SE-100 may be coated on glass or organic fabrics for service at high or low temperatures or where resistance to weather, ozone, corona or chemicals is required.



Flexible at −120 F: A glance at the blue curve shows the difference (Young's Modulus in flexure) of SE-550 versus organic rubber after 24 hours.

SE-550—STILL FLEXIBLE AFTER 24 HOURS AT −120 F!

G. E.'s new extreme low-temperature silicone rubber, SE-550, combines high strength and elongation with maximum low-temperature usefulness. SE-550 shows practically no increase in modulus at −100 F and retains useful flexibility at −120 F. This flexibility is achieved without sacrifice of high-temperature resistance or any of the other desirable properties inherent in silicone rubber.

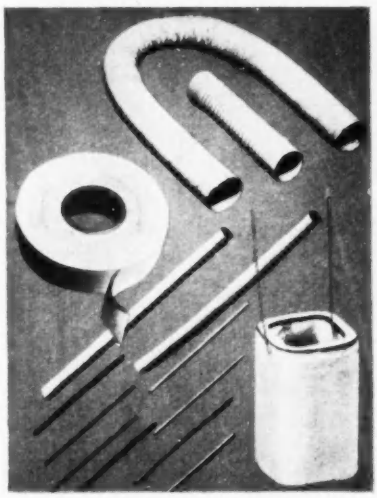


Compression test: Same-size pieces of ordinary silicone rubber and SE-360 are compressed for 22 hrs. at 350 F. Note how SE-360 (right) "comes back" to original size.

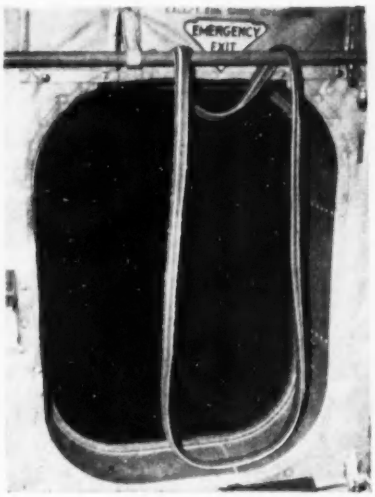
SE-360—MORE "COME BACK" THAN ANY KNOWN RUBBER!

G. E.'s new low compression set silicone rubber, SE-360, is designed to provide more positive sealing action in parts subject to compression at elevated temperatures. In addition to its outstanding low compression set, SE-360 has unusually low shrinkage when cured. This means parts with more uniform properties, closer tolerances and opportunities for your fabricator to cut scrap loss.

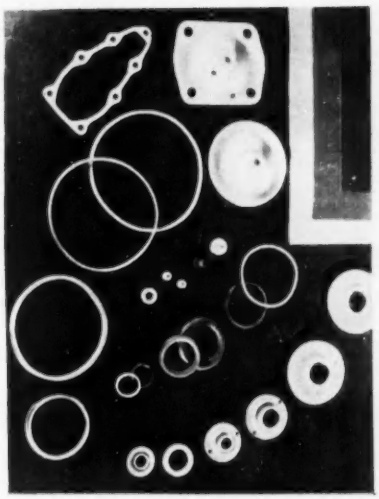
POSSIBILITIES OF THREE GREAT
RUBBER COMPOUNDS
CONFIRMED BY APPLICATION



G.E.'s SE-100 silicone rubber is finding steadily increasing application in the electrical industry for coating cloth, tapes and sleeving; for coating glass-served wire; for encapsulating coils. Among the many mechanical uses for SE-100 are ducts and tubing; gaskets and seals; diaphragms.



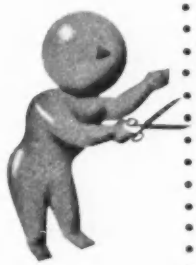
Gaskets for emergency hatches (shown here at 50 below zero F) astra domes and access windows on the Douglas Globemaster are now made of G.E.'s SE-550 silicone rubber because it remains flexible and maintains a seal at extremely low temperatures; does not stick to metal after long inactivity.



O-rings, gaskets and seals are being designed with G.E.'s new SE-360 silicone rubber for applications where sustained resilience at high temperatures is required. Aircraft, automotive and railway design engineers find SE-360 ideal for jet engine parts, transmission seals and Diesel gaskets.

FOR MORE INFORMATION

about these new G-E silicone rubber compounds, just mail the coupon! You will also receive a free copy of "Imagineering with Silicone Rubber" which describes other G-E silicone rubber products and tells how you can put them to work.



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Any Elmes Metal-Working Press, standard or special, can be supplied with pipeless construction—and at no premium. Why don't you get the facts on the savings that an Elmes Pipeless Press can make for your production? Call in an Elmes engineer now.

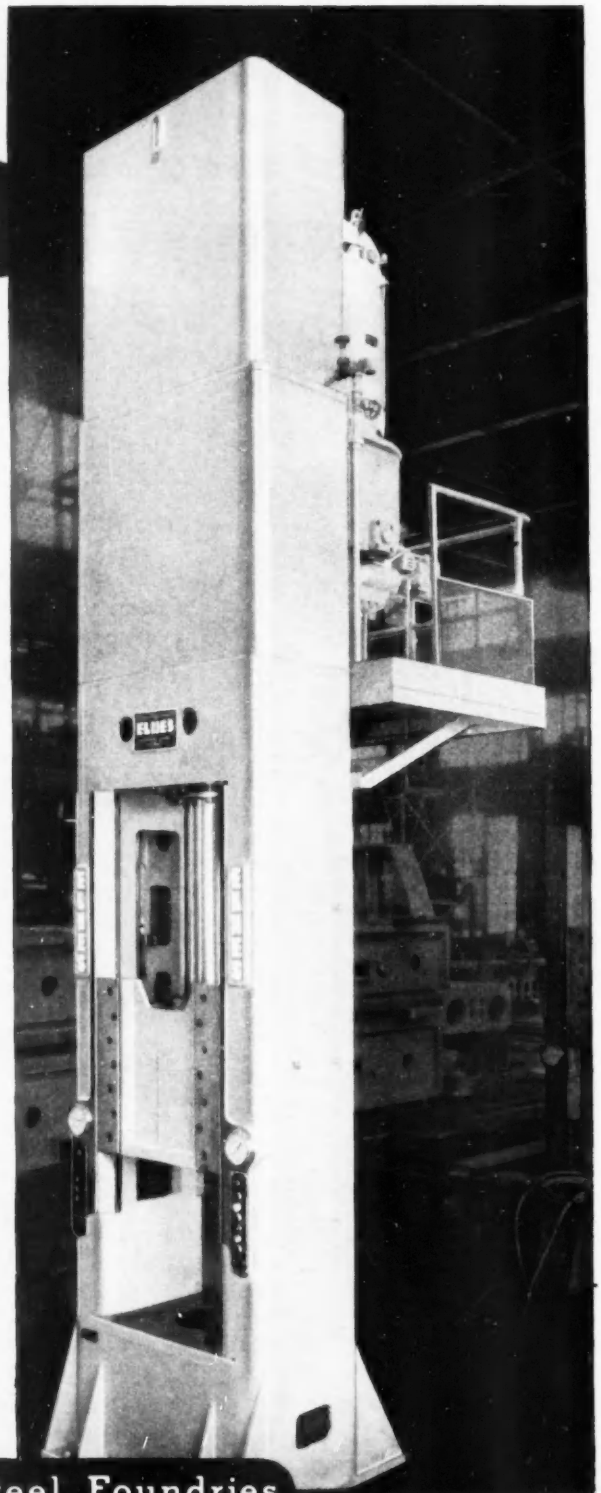

Photo shows an Elmes 125-Ton Pipeless Drawing and Forming Press, just completed. Another in background, under construction.

Write for your free copy of Elmes Bulletin No. 1011 giving detailed information on the Elmes Pipeless Press design.

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News of the MACHINERY INDUSTRIES

By Thomas Mac New

Value of Machine Tools Shipped During 1952 Showed an Increase of Almost 70 Per Cent Over 1951 Totals.

Machine Tool Shipments

The recently compiled figures of the Bureau of Census, Dept. of Commerce reveal that 378 machine tool companies shipped $1.065 billion worth of tooling during 1952. This is an increase of 69 per cent over the value of machine tools shipped during 1951.

Milling machines recorded the greatest gain dollarwise with total 1952 shipments amounting to $159 million, as compared to $70 million for 1951. A total of 16,158 machines were shipped last year in comparison with 11,287 for 1951.

In the second place, with respect to the per cent of value, boring machines enjoyed a 97 per cent increase over 1951. Total shipments for 1952 amounted to $147.9 million, as compared with the 1951 figure of $75.1 million. Of the 1952 shipments, 18 per cent of the total value of boring machines was accounted for by shipments of 1380 machines of the precision type.

New England and the East North Central States accounted for 90 per cent of the total value of machines shipped in 1952. Ohio ranked first with 33 per cent of the U. S. total.

Gear Volume

The American Gear Manufacturers Association gear index for June shows a 22.8 per cent decrease in volume as compared with May, 1953. For June, the index figure is computed to be 146.5 (1947-49 equal 100).

Productivity Measure

It is pointed out by the Council for Technological Advancement in a study of factors involved in the the measurement of Productivity that productivity expresses not merely labor efficiency but the efficiency of all factors of production.

To illustrate productivity as a measure of economic progress, two examples are given below. The Council states that since productivity is a ratio, a rise in output per man-hour does not invariably denote an increase in economic progress. The productivity index may rise as both output and man-hours rise; and as both output and man-hours fall as shown in the tables, Example I and Example II.

Productivity has increased in both instances, but there has been no economic progress in the second example; there has been no increase in output; there has been no rise in the level of living which is determined by output per person in the population rather than output per man-hour. These two examples show that productivity is an elusive concept.

In summation, the Council states that if it is assumed that economic progress is capable of measurement, and this measurement is accurately reflected in productivity indexes, it should be emphasized that: yearly increases in productivity for the economy as a whole have not been steady; there are great changes in productivity between different industries; and there are great differences in changes in productivity between firms in the same industry.

Casting Institute

Technical discussions at the 13th Annual Meeting of the Alloy Casting Institute, held recently at Hot Springs, Va., covered a variety of research subjects with emphasis on titanium casting techniques and shell molding. In addition to presentation of the technical papers, the annual election of officers was held. G. A. Baker, vice-president, Duriron Co., was elected president of the organization.

AIEE Machine Tool Conference

The sixth annual American Institute of Electrical Engineers' Special Conference on Machine Tools will be held Oct. 14-16 in the Hotel Cleveland, Cleveland, Ohio, it has been announced by R. H. Clark, chairman of the AIEE Subcommittee on machine tools. Co-sponsor of the conference, is the Cleveland Section of AIEE. It will feature sessions on electronic drives, automatic machine control, electrical codes in the machine tool industry, the aircraft industry, economics of control devices, tracer controls, clutches, dynamic brake motors, a rerating of motors. A panel discussion, inspection of industrial plants

EXAMPLE I

Rising Output, Rising Man-hours and Rising Productivity

	1951	1952
Output	1000 units	1500 units
Man-hours	40 hours	50 hours
Output per Man-hour	25 units	30 units
Index of Output per Man-hour (1951 — 100)	100	120
Change in Productivity		+20 per cent

EXAMPLE II

Falling Output, Falling Man-Hours and Rising Productivity

	1951	1952
Output	1000 units	900 units
Man-hours	40 hours	30 hours
Output per Man-hour	25 units	30 units
Index of Output per Man-hour (1951 — 100)	100	120
Change in Productivity		+20 per cent

and a banquet and a luncheon also are planned.

At the banquet Wed., Oct. 14, the guest speaker will be Frederick S. Blackall, president of the American Society of Mechanical Engineers, and president of the Taft-Pierce Co.

The schedule of technical sessions and symposiums follows:

Wed., Oct. 14: "Specific Applications of Electronic Drives to Machine Tools," by F. E. McLane, Westinghouse Electric Corp., with J. I. Ehrhardt, Excello Corp., Detroit, Mich., presiding.

"Automatic Machine Control," by Perry L. Nies, Ultrasonic Corp., with A. L. Krause, Brown & Sharpe Co., Providence, R. I., presiding.

"Some Bases & Interpretations of the National Electric Code as Applied to the Electrification of Machinery," by Norman F Diederich, Clark Controller Co.

"Today's Machine Tools Need Modern Electrical Codes," by E. J. Loeffler, Warner & Swasey Co.

Thursday, Oct. 15: "The Aircraft Industry and Machine Tools," by William L Davis, Douglas Aircraft Co.; "Economics of Location and Control Devices on Machine Tools," by W. H. Compton, Wood-Compton Co., and Dickey Dyer, the Work-Factor Co.; "Practical Considerations in the Use of Tracer Controls," by George L. Rogers, and John L. Dutcher, General Electric Co., W. P. Curtis, of the Ford Motor Co., will preside.

Friday, Oct 16: "Clutches for Machine Tools," by A. F. Gagne, Jr., consulting engineer and assistant professor at Cornell University; "Dynamic Brake Motor," by Samuel Noodleman, Standard Dayton Corp.

Panel Discussion: "Remarks on the Rerating of Electric Motors," presented by C. O. Hedges, chairman, and representatives of the Motor and Generator Section of the National Electrical Manufacturers Association. J. P. Madden, of G. A. Gray Co, Cincinnati, will preside.

On Friday afternoon, inspection trips will be made to plants of the Chevrolet division, Reliance Electric and Engineering Co, and Warner & Swasey Co.

Around the Industry

Cyril Bath Co. has recently opened a new $2 million plant 20 miles southeast of Cleveland. The new building is located on Aurora Road, Solon, Ohio. It comprises 50,000 sq ft and is of the one-floor, steel-frame type. The plant will make stretch formers for the aircraft industry.

Dodge Manufacturing Corp., Mish-

(*Turn to page* 134, *please*)

MACHINE TOOL SHIPMENTS—1948-1952

Class of Product	Year	Shipments: Number	Shipments: Value (thousands of dollars)
MACHINE TOOLS, TOTAL	1952		$1,064,665
	1951*		629,344
	1950		315,743
	1949		241,370
	1948		277,521
Boring machines	1952	4,275	147,932
	1951	2,518	75,068
	1950	1,363	29,402
	1949	1,212	29,430
	1948	1,268	24,098
Broaching machines	1952	1,016	21,014
	1951	681	11,975
	1950	374	4,883
	1949	290	3,411
	1948	343	3,779
Drilling machines	1952	30,492	108,111
	1951	19,257	70,916
	1950	9,917	33,129
	1949	6,305	25,271
	1948	10,125	32,816
Gear-cutting and finishing machines (including gear-tooth grinding, honing, lapping, polishing, and buffing machines; and gear shapers)	1952	2,725	47,462
	1951	2,452	38,336
	1950	1,402	19,819
	1949	1,095	14,231
	1948	1,367	16,407
Grinding and polishing machines (except gear-tooth grinding, honing, lapping, polishing, and buffing machines)	1952	88,341	205,643
	1951*	105,090	120,833
	1950	79,274	60,859
	1949	64,257	45,660
	1948	98,792	47,294
Lathes	1952	46,953	285,916
	1951*	43,107	170,528
	1950	30,251	89,716
	1949	18,631	62,289
	1948	29,322	81,106
Milling machines	1952	16,158	159,021
	1951	11,287	70,257
	1950	6,975	36,452
	1949	4,397	31,400
	1948	6,064	34,914
Planers	1952	158	8,641
	1951*	141	6,638
	1950	84	3,035
	1949	99	3,699
	1948	157	4,828
Shapers (except gear shapers)	1952	1,423	9,933
	1951	1,096	6,095
	1950	794	3,397
	1949	666	2,831
	1948	1,369	5,826
All other machines tools[1]	1952		70,992
	1951*		58,698
	1950		35,051
	1949		23,148
	1948		26,453

* Revised.

[1] Includes centering machines; key seating machines; slotting machines; sawing and cut-off machines; contour-sawing and filing machines; tapping machines; threading machines; and all other machine tools.

Source: U. S. Department of Commerce.

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Nondestructive Test Equipment for Laboratory or Factory Use

Introduction of the Magnatest FM-100 conductivity meter has, by permitting rapid measurement, made the physical property of conductivity a practical and useful industrial tool. Conductivity measurements are quickly made available for laboratory control or factory use. The need for wire-like samples or cross-sectioning of parts is eliminated. The FM-100 gives absolute conductivity measurements of non-ferrous conducting materials directly from a large dial on the front of the unit. An operator places the hand probe on a part and reads the dial. All that is required is a relatively flat area about ⅜ in. in diameter on which to place the probe.

The other general category of applications depends upon the relationship between conductivity and other physical properties. The conductivity of aged aluminum alloys, for example, varies with temper. Therefore, once standard comparisons are made in the laboratory, the indent hardness test can, in many cases, be replaced by the Magnatest instrument. The FM-100 can also be used for process and quality control in heat treatment. Again standard comparisons must be made. Another application is controlling the purity of melt of non-ferrous metals and alloys. *Magnaflux Corp.*

Circle 66 on page 89 for more data

(*Turn to page* 82, *please*)

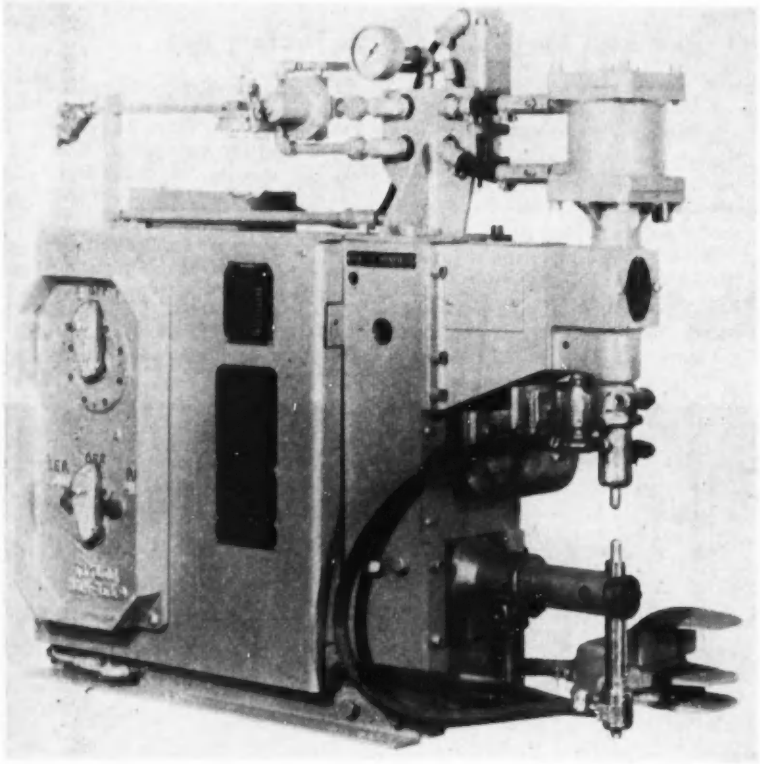
Magnatest FM-100 conductivity meter is shown here in operation.

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89

(Continued from page 81)

Air-Operated Resistance Welder



Taylor-Winfield electric resistance air-operated welder.

The recently introduced Type EB-3 air-operated electric resistance welder is a precision production tool which can be placed in a bank or gang for production jobs. Actual throat depth is eight in. A welding force of either 750 lb or 1000 lb maximum is obtained by use of 80 psi line pressure. Electrode stroke is 1¾ in. maximum. The lower horn of the Type EB-3 Welder is two in. diam and vertically adjustable to four in., plus an additional 1¼ in. vertical adjustment when the lower horn holder is inverted. Lower electrode holder (ejector type) is six in. long and one in. diam, with a No. 1 Morse Taper. Upper electrode holder (ejector type) is built as a permanent part of the upper terminal and is for a No. 1 Morse Taper electrode. Upper and lower electrodes are Code B-216, domed type, Class 2 alloy with a No. 1 Morse Taper. Overall length is 1½ in.

While many possible combinations of electrical controls are available, the use of synchronous-precision controls is recommended where exacting work requirements are essential. A magnetic or electronic contactor, as well as a sequence-weld timer, is necessary for the Type EB-3 Welder. *Taylor-Winfield Corp.*

Circle 67 on page 89 for more data

Cable Conveyor Line

Cable Link trolley.

A line of cable conveyor systems based on the use of plow steel cable, cut to 16, 24 and 32 in. lengths, with steel buttons swedged on both ends is now being offered. The lengths of cable are called "cable-links."

The swedged-button ends of the cable-links recess in the cavities of malleable steel brackets. The brackets thus envelope the ends of cable-links. Steel nuts, threaded on the tapered sleeves of the brackets, exert a 360 deg pressure on the cable, retaining the trolley assembly at an immovable station. Trolleys can be placed on eight, 16, 24 and 32 in. centers.

Three conveyor models are available, capable of light, medium and heavy-duty materials handling. Model C-L 120 operates on two in. tee rail or split six in. junior I-beam. Models C-L 130 and C-L 140 operate on standard three in. and four in. I-beams respectively. The maximum suspended load capacities of these systems range from 80 lb to 500 lb per station. Pull loads per drive are reported as ranging from 1500 lb to 4000 lb. *Cable-Link Corp.*

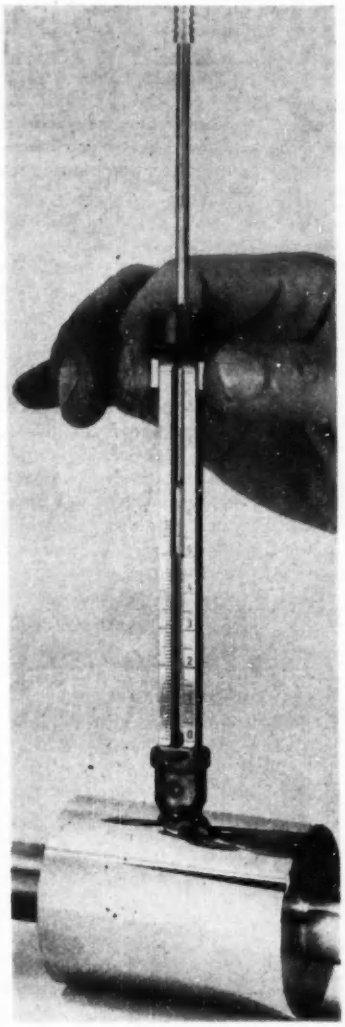
Circle 68 on page 89 for more data

Electrolytic Stripper

Recently developed is a liquid product for electrolytic stripping of defective copper, nicked, and chromium plates from zinc base die castings. Called Compound L-88, it is available in 13-gal carboys. *Enthone, Inc.*

Circle 69 on page 89 for more data

Small Hardness Testers Feature Simple Operation and Portability



Sklerograf hardness tester.

New pocket-size hardness testers, known as Sklerografs, are specifically designed for on-the-spot testing and are provided with tubular nickel containers for ease of carrying on the job.

Method of operation is simple. The instrument is placed in a vertical position on top of the article to be tested, and the rebounding bar, which carries a hardened steel ball point, is raised until held in place by the locking device. When the locking device is released by pressing a catch, the bar falls and rebounds to a point corresponding to the hardness of the object, where it is retained. It is said that hardness can then be read within an accuracy of one point Rockwell C., by noting the position of the indicator ring on the hardness bar against the graduated scale. Conversion tables supplied with the Sklerograf permit quick conversion of the scale reading to Shore, Rockwell C, Rockwell B or Brinnell hardness.

Two models are available. Model M weighs only 5¼ oz, including container. This model leaves no indentation on the surface of the material tested, and hence may be used on finished pieces, according to the maker.

A somewhat larger type, Model D, is designed to withstand the rougher usage likely to be encountered in shop practice. Weight of instrument and container is 9 oz. This model leaves a small indentation on the surface. *Kurt Orban Co., Inc.*

Circle 70 on page 89 for more data

Vertical Rotor Dust and Fume Eliminators

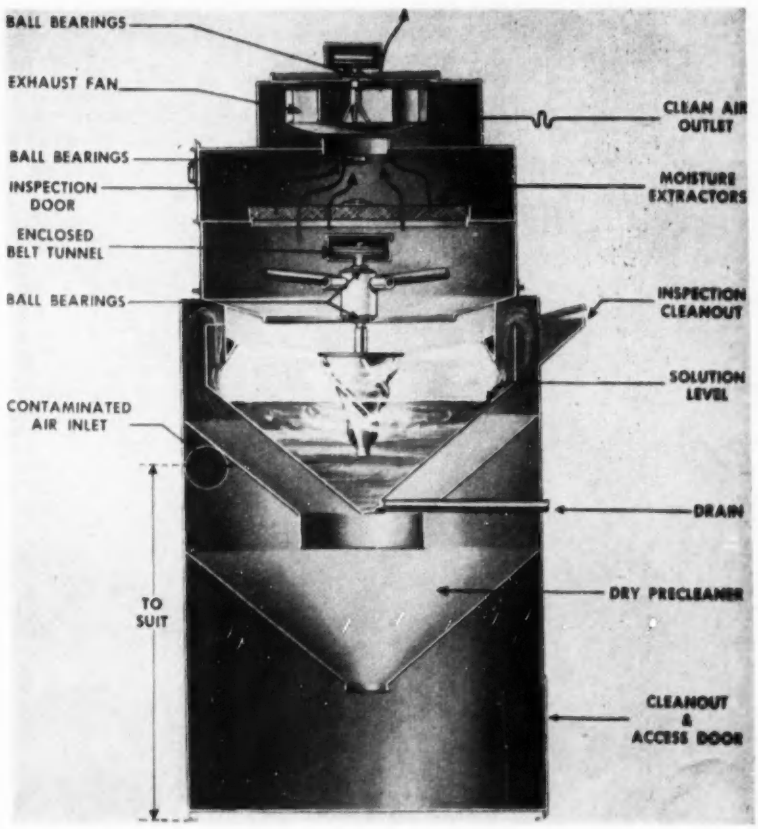
Two new Centri-Merge vertical rotor wet type dust and fume eliminators for industrial applications have been brought out recently. One unit is used for wet collection and elimination only, while the other is a combination primary dry and secondary wet collection unit. The latter has a built-in dry type pre-cleaner for dry collection of heavier and most fine particles, and is said to be particularly useful where material salvage is an operational requirement.

Both units combine the cyclonic principle of dust separation and positive high pressure water action to remove impurities from the air in a rotating torrent of water. For certain applications, other liquids than water may be used. Capacities range from 500 to 50,000 cfm.

The units are available with an integrally constructed fan or they may be arranged for standard fan installation. Disposal of material collected in the tank is by drag conveyor, hopper tank skim-off, or manual clean-out. After cleaning, excess moisture is removed from the air by extractors. Clean-out doors permit cleaning while in operation. *Schmieg Industries, Inc.*

Circle 71 on page 89 for more data

(*Turn to page 84, please*)



Schmieg wet type eliminator for dust and fumes.

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 89

(*Continued from page 83*)

Microformer Type Extensometer

A Microformer type extensometer, designed to produce stress-strain diagrams with high strain magnifications and low magnifications, respectively, below and above the elastic limit of materials, has been announced. This new Baldwin TS-M Dual Extensometer is used with a recorder of the Microformer type, employing these variable miniature transformers for transmission of strain variations.

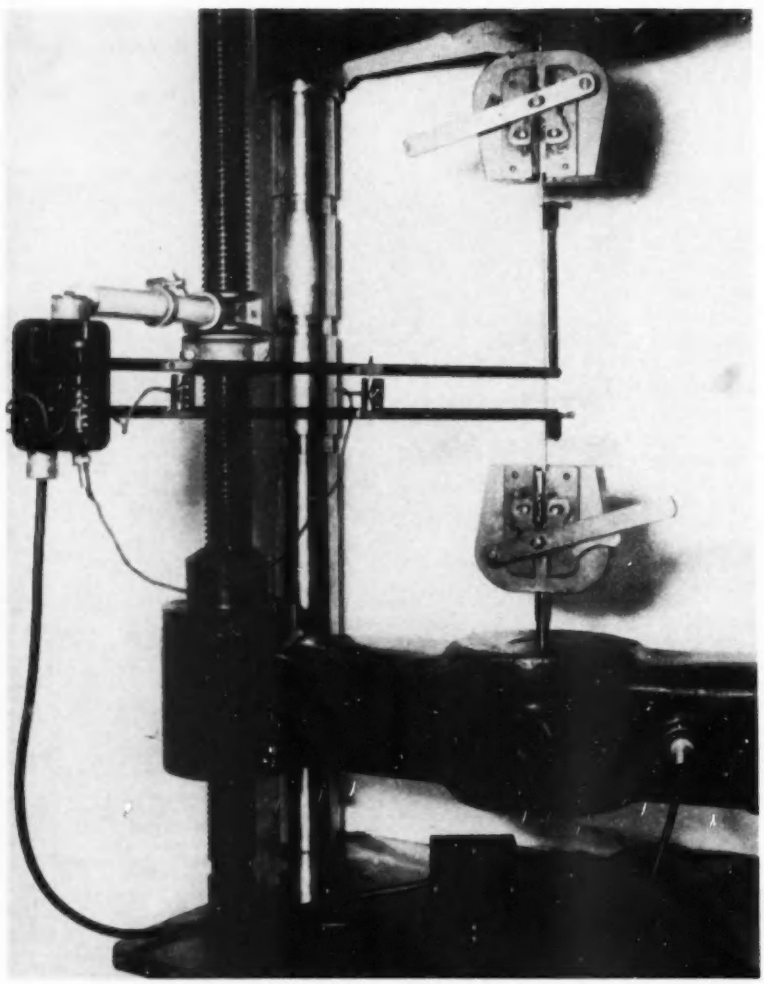
Ten strain magnifications ranging from 5:1 to 200:1 are provided by means of Microformers at three positions on extensometer slide and horizontal arms, by the use of extension arms, and by the selection of three magnifications available in the Baldwin Microformer recorder.

Dual magnification is accomplished during any tensile test by switching manually from one to another of the Microformers on the extensometer when any selected value of strain or stress is reached. A selector switch connects to the recorder outlet receptacle.

With standard optional adapters this extensometer can be used on wires, flats, and round specimens. Elongations as great as two in. are measurable.

The measuring unit assembly is supported by an adjustable arm which is clamped to one of the vertical columns of the testing machine. The slide frame is designed to assure straight linear movement of the Microformer and core near the pivots. The extensometer may be used with or without the arm extension on which one of the three units is mounted. *Baldwin-Lima-Hamilton Corp.*

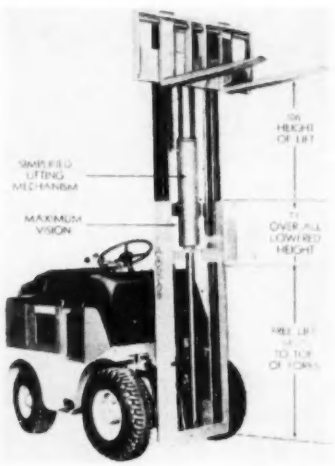
Circle 72 on page 89 for more data



Baldwin Model TS-M dual extensometer.

High Free Lift Mast

A specially designed mast and lifting cylinder assembly, originally developed for installation on larger capacity units, is now available also on all three capacities of Towmotor Model LT-35 lift trucks.



Towmotor high free-lift mast.

The assembly expedites high stacking of heavy loads in low headroom areas, providing unusually high free lift at lowest over-all truck height. It is interchangeable with standard masts, but affords more free lift and total lift for any given mast height. Lifts available range up to 160 in. with 81¾ in. free lift. *Towmotor Corp.*

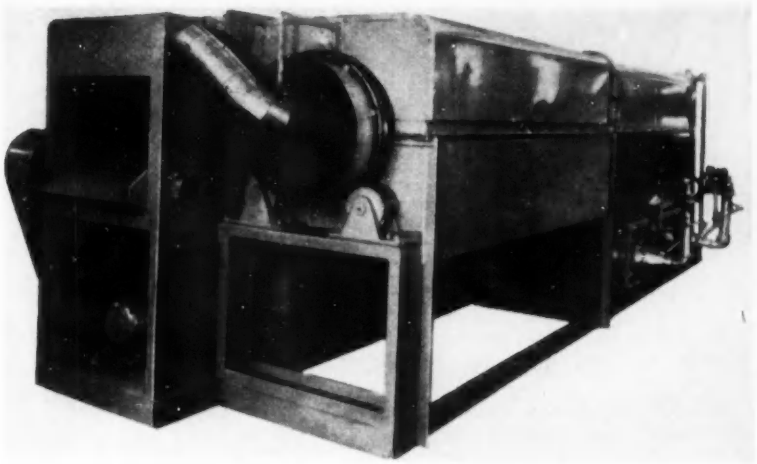
Circle 73 on page 89 for more data

Washing Machine for Metal Parts

Recently introduced is a combination rotary drum and flat bed washing machine. It is designed to remove drawing compounds, cutting oils, grease, and shop dirt from metal parts quickly and easily.

Small parts that can be tumbled are washed, rinsed, and dried in the drum of the machine. Parts which are too large for the machine, as well as the tote boxes, are readily processed on the conveyor, according to the manufacturer of the equipment. *Metalwash Machinery Corp.*

Circle 74 on page 89 for more data



Metalwash combination washing machine.

Multiple-Spindle Automatic Nut Torquing Machines

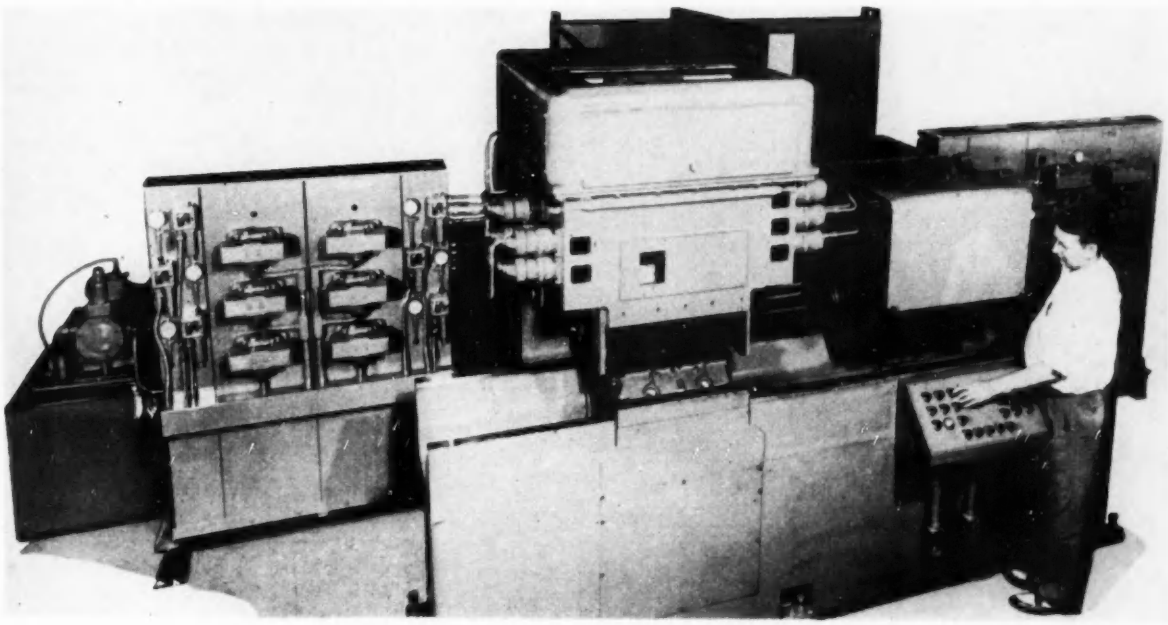
A line of automatic nut-torquing assembly machines is said to cut assembly line costs and improve product quality of bolted assemblies. These hydraulic powered multiple spindle machines will automatically tighten a nut or bolt to a given torque specification, tighten a bolt to a specified elongation or drive a stud to a given depth. They act as automatic gaging machines and reportedly reduce scrap, since individual spindles will not drive bolts, studs or nuts if their thread fits exceed specified tolerances or if the fastener is improperly started.

The machines use a drive in which each spindle is powered by a hydraulic fluid motor. The motor is either direct-connected to the torquing spindle or a double-enveloping cone-drive worm gear set is provided in the drive, depending on the torque requirements.

When driving a bolt, stud or nut, the hydraulic motor is run initially at low pressure and low speed, thus providing a low torque drive and assuring positive engagement between the fastener and the rotating spindle sockets. The initial low torque prevents driving of improperly fitted or cross-threaded fasteners. When the sockets have engaged the fasteners, an increased volume of oil is then directed to the fluid motors, which rotates the spindles at high speed, providing a fast rundown. When the fastener is within one or two turns of depth, a valve is actuated by a depth control finger, which directs a high pressure, low volume oil flow to the hydraulic motor. Thus a high torque, slow speed drive is provided.

Torque capacities of the nut torquing machines are from 35 to 120,000 in. lb. Torque specifications can be held within a 2 per cent tolerance; length or elongation within 0.0004 in. The machines are fully adapted to transfer type mass production assembly lines. *Hautau Engineering Co.*

Circle 75 on page 89 for more data
(*Turn to page 86, please*)



Hautau nut torquing machine tightening 10 main bearing cap screws on a V-8 engine block.

NEW EQUIPMENT PLANT · PRODUCTION

For additional information, please use postage-free reply card on page 89

(*Continued from page* 85)

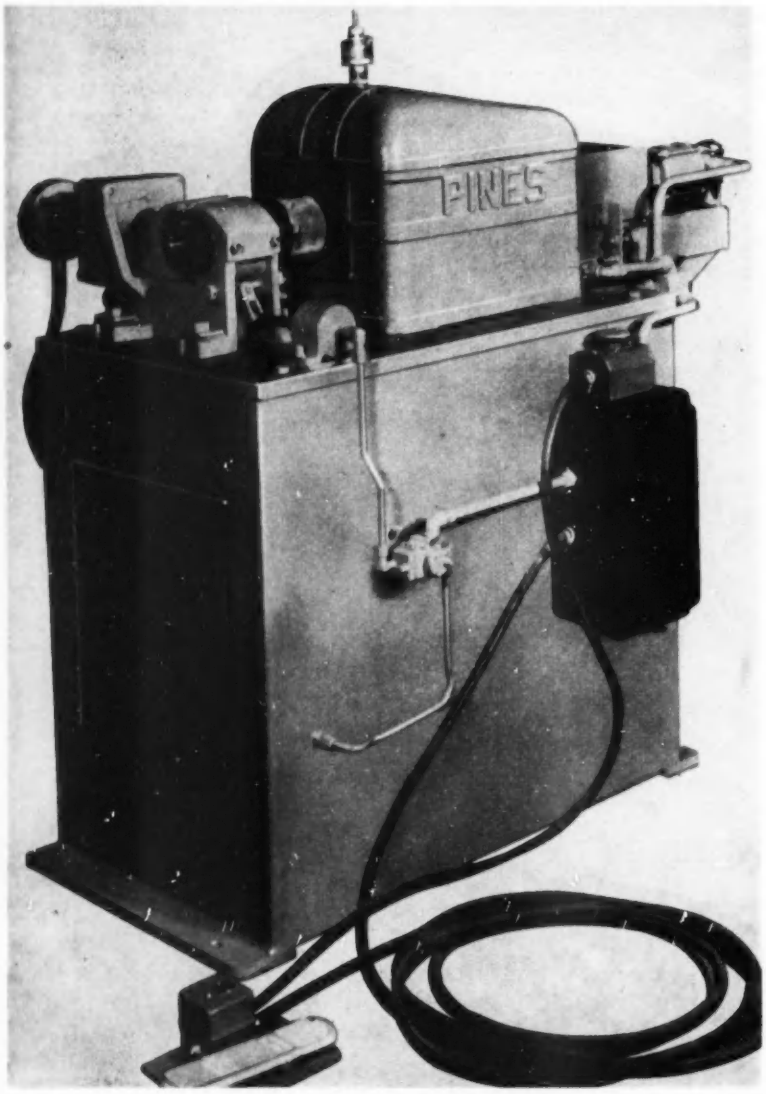
Air-Operated End-Finishing Machine

A new air-operated end-finishing machine, designed for large work up to three in. O.D., has a two in. stroke and a maximum spindle speed of 2000 rpm for fast operation.

Chuck and spindle air cylinders are controlled through an electric foot switch. The movement of the foot switch closes the chuck, the work-locating stop is pivoted clear by a small air cylinder mounted on the side of the clamping unit, and the spindle is advanced through the machining cycle. The spindle advance unit is a Bellows air cylinder with a hydro-check which controls the feed rate of the tools. An adjustable stop automatically retracts the spindle when the cut is completed. Both the chuck and spindle advance cylinders operate from the same air line at 70-80 psi. Cycle time of the unit, less cutting time, is 1.5 sec.

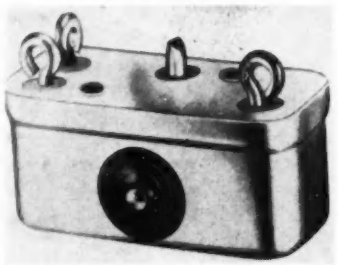
The unit is designed for such operations as light turning with hollow mill tools, chamfering and pointing bar stock, shaping tube or rod ends, or center-drilling. Tools and chuck jaw inserts are interchangeable to fit required work diameters within the maximum three in. diameter range. The spindle drive motor, with variable-speed control for work diameters, is enclosed within the machine base. *Pines Engineering Co., Inc.*

Circle 76 on page 89 for more data



Pines Series 700 end-finishing machine.

Sealed Snap Switch



Haydon snap switch.

Now on the market is a line of hermetically sealed precision snap switches. Small, lightweight, and rugged, the switch reportedly can successfully withstand changes in pressure and temperature, exposure to high rates of acceleration, shock and vibration, and exposure to corrosive elements.

Contact traverse rate is said to be rapid with negligible contact bounce and true snap make and break. A beryllium copper switch blade with pure silver contacts welded in position offers good electrical and thermal conductivity.

Solder-type terminals with two No. 20 stranded wires have a hermetic enclosure that will withstand 100 psi internal pressure. Resistive ratings from 0 to 50,000 ft include 28 v, dc, 10 amp and 110 v, ac, 10 amp from 60 v to 400 c, and a minimum life of 100,000 operations at rated load. *Haydon Switch Co.*

Circle 77 on page 89 for more data

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Cut-off Valve for LPG Fuel Systems

Recently announced is a stainless steel solenoid valve known as Series V61. This cut-off type valve, designed for LPG fuel systems, such as in trucks, tractors, and buses, is said to feature "snap-shut" action and bubble-tight sealing.

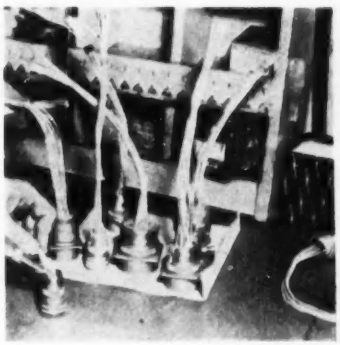
The valve is reported to be equally adaptable to factory or field installation. The manufacturer states that it has only two moving parts and can be disassembled and serviced without removal from the line.

A heavy spring return reportedly assures positive shut-off regardless of the valve's position. Operating dependability is guaranteed under conditions of high vibration, temperature, humidity, and low voltage.

Standard models in the series are the V61-200, rated at 250 psi with 0.136 in. orifice, and V61-300 which is rated at 300 psi with 0.125 in. orifice. Both models are tapped for ¼ IPS pipe size and are available for six or 12-v d-c operation. Size is: 2¾ in. high by 2¼ in. in diameter, and weight is 1½ lb. *Skinner Electric Valve Div., Skinner Chuck Co.*

Circle 31 on page 89 for more data

Dielectric Sealer for Wiring Connections



Although developed initially for the aircraft industry, a dielectric sealer has also been found useful by electrical equipment manufacturers. Intended for use as a flexible potting compound on electrical wiring connections, it is said to retain physical properties throughout a temperature range of −65 to 200 F.

EC-1120 dielectric sealer is a synthetic rubber material. Applied in liquid form, it cures by chemical reaction to a firm, rubber consistency and reportedly gives long lasting protection against corrosion and vibration. It resists fuels and oils which may come in contact from spillage or leakage and is unaffected by salt air.

A two-part material, the sealer requires the addition of an accelerator before use. It is said to flow around all wires. *Adhesives and Coatings Div., Minnesota Mining & Mfg. Co.*

Circle 32 on page 89 for more data

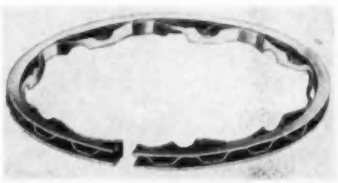
Sander-Polisher for Various Jobs

Recently announced is a sander-polisher for: smoothing and filling base metal; feathering and polishing primer and all types of painted surfaces; rubbing out overspray on enamel less than 48 hrs old; and finished wax and polish jobs.

The maker claims finest hand finish results mechanically without swirl marks, burning or scuffing. Counterbalanced heads are said to eliminate centrifugal action. No special bonnets are necessary, and regular wiping cloths may be used for wiping up and final finishing. *Cyclo Mfg. Co.*

Circle 33 on page 89 for more data

Chromium-Plated Oil Control Ring



Recently introduced is a multiple-piece chromium-plated oil control ring known as the unitized CSR-200. The unit is pre-assembled at the factory with the individual pieces bonded together into an integral assembly with a special adhesive agent which dissolves in the heated engine oil during run-in, according to the maker.

The ring is said to have following advantages: reduction in engines re-

(*Turn to page* 88, *please*)

NEW PRODUCTS

For additional information, please use postage-free reply card on page 89

(Continued from page 87)

jected at assembly; scuffing virtually eliminated at run-in and for the life of the engine; higher level of oil economy for longer periods of service; reduced ring and bore wear and friction. *Muskegon Piston Ring Co.*

Circle 34 on page 89 for more data

Loading Dock

Now available is an adjustable, self-contained loading dock which reportedly can easily be installed in front of the present dock, or can be recessed in dock area at a minimum of installation expense. Known as Model 72-U "Unit Dock," it is a completely manually operated unit with both vertical and horizontal adjustment, according to the manufacturer.

The dock compensates for the variation between truck and dock heights by vertical adjustment and is said to insure true carrier approach by horizontal adjustment. *Rite-Hite Div., Loomis Machine Co.*

Circle 35 on page 89 for more data

Unique Spark Plug

Recently developed is a spark plug for modern high compression engines. It has an aluminum oxide, airplane-type insulator that is said to give greater thermal conductivity.

Three electrodes surround the center nickel terminal of the plug. These points are tapered to make a faster, hotter spark.

It is claimed that the spark jumps from the central electrode to any one of the other electrodes. When the gap between these two becomes microscopically changed, the spark jumps to the next unused terminal.

A spark always jumps to the closest opposite pole, even when that distance is not measurable by ordinary means. This process continues to the third point and then repeats around so that the wear is distributed over three points instead of one. *Luthy Aeronautical Sales Co.*

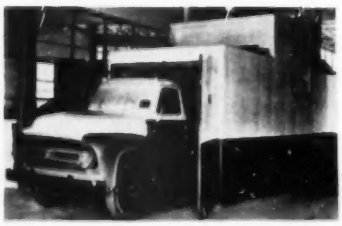
Circle 36 on page 89 for more data

Baking Oven

Recently announced is an automotive refinishing baking oven that is available for heating by gas (see cut), electricity, or steam.

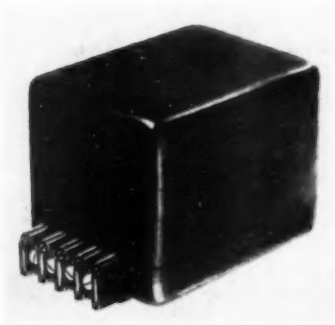
The hot air is blown in through intake-outake ducts protruding from the ceiling of the oven. When sufficient temperature has been reached, cool air is said to be released through the same ducts. *Michigan Oven Co.*

Circle 37 on page 89 for more data



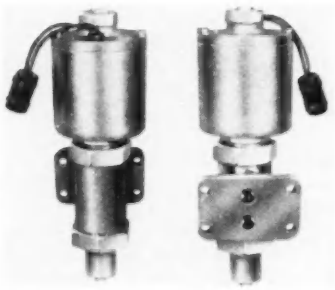
Automatic Starter

Recently announced is an automatic starter for cars equipped with Hydra-Matic, Dynaflow, or Fordomatic. The unit, called Starta-Matic, is said to eliminate the button or ignition key starter switch with no trouble.



It is claimed that the driver merely shifts to Neutral with the ignition on, and the car starts. The device reportedly allows quicker starting without gear clash and faster shifting to drive position. The unit is adaptable to both six- and 12-v ignition systems, according to the manufacturer. *Safety Devices Co.*

Circle 38 on page 89 for more data



Four-Way Type Valve

Now on the market is a four-way type valve for accurate remote control of air-operated, mechanical devices. Known as the Electro valve, it is intended for use with all types of machinery using single or double-acting, pneumatic-power cylinders. It may also be used as a pilot control for master valves.

The valve operates on any 110, 220, or 440-v, d-c, 60-c power supply. It's reportedly fast-acting — within two cycles (60-c line).

The valve is capable of maintaining in consistent operation a speed of 500 strokes per minute. *Sciaky Bros., Inc.*

Circle 39 on page 89 for more data

(Turn to page 144, please)

Free INFORMATION SERVICE

Postage-Free Postcards Are Provided Here for Your Convenience to Obtain FREE LITERATURE and Additional Information on NEW PRODUCTION AND PLANT EQUIPMENT, AND NEW PRODUCTS Described in This Issue of AUTOMOTIVE INDUSTRIES. Please Circle Code Numbers of Items in Which You Are Interested, Print Name, etc., and Mail Promptly for Quicker Service.

USE THIS POSTCARD

FREE LITERATURE

Extruded Plastics

Now available is a brochure which presents some of the latest applications of thermoplastic rods, tubes, and shapes. Automotive applications are included. *Anchor Plastics Co., Inc.*

Circle 1 on postcard for free copy

Sand Control

Now available is a handy 32-page booklet on sand control in the production of metal castings. Suggestions on the selection of foundry sands, descriptions of their various physical properties, and test procedures for maintaining these properties are given. *Claud S. Gordon Co.*

Circle 2 on postcard for free copy

Spacing Devices

Bulletin S-103 describes the Super-Spacer spacing devices in eight and 12-in. sizes for a wide range of production applications. *The Hartford Special Machinery Co.*

Circle 3 on postcard for free copy

Instrument Bearings

Booklet AIB covers the classification, design and operating requirements of instrument bearings and their application. Intended for instrument engineers, requests for copies should be on business letterheads. *New Departure Div., General Motors Corp., Bristol, Conn.*

Aircooled Engines

Recently published is a 64-page booklet on the design, construction, and varied applications of a line of heavy-duty aircooled engines. *Wisconsin Motor Corp.*

Circle 4 on postcard for free copy

Product Applications

Nos. 5, 6 and 7 of Vol. 2 of "Hyd-Air" contain technical sections describing applications of the manufacturer's cylinders, boosters, and accumulators. *Miller Motor Co.*

Circle 5 on postcard for free copy

Conveyors

Ready for distribution is a booklet on a line of roller gravity conveyors in several sizes for various applications. *Lamson Corp.*

Circle 6 on postcard for free copy

Secure Locknuts

Now available is a folder on a series of locknuts with a special locking principle. *Security Locknut Corp.*

Circle 7 on postcard for free copy

Arc Welding Machines

Catalog No. 1340 describes over 20 different models of arc welding machines. *Air Reduction Sales Co.*

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(Please turn page)

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49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
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85	86	87	88	89	90	91	92	93	94	95	96

PAGE PRODUCTS

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(Please Print)

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ADDRESS ..... (CITY) ..... (ZONE) ..... (STATE)
(No. & STREET)

FIRST CLASS
Permit No. 36
(Sec. 34.9 P.L.&R.)
New York, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

POSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES
P. O. Box 66,
Village Station,
New York 14, N. Y.

Readers Service Dept.

Broaching Machine

Fresh off the press is a brochure describing an electro-mechanical drive, horizontal broaching machine with optional dual speed and dual cycle that is capable of speeds up to 300 fpm and more. *The LaPointe Machine Tool Co.*

Circle 9 on postcard for free copy

Clad Fabrication

Now available is a chart which gives basic information for arc-welding and flame-cutting clad steel plates. *Lukens Steel Co.*

Circle 10 on postcard for free copy

Coolant Filters

Now ready is a folder on Delpark coolant filters for Gardner grinding machines. *Industrial Filtration Co.*

Circle 11 on postcard for free copy

Industrial Lighting

Recently published is the 1953 edition of a book containing the latest specifications for industrial lighting equipment. *RLM Standards Institute.*

Circle 12 on postcard for free copy

Lathes

Bulletin No. 36 covers Dual Tracer lathes designed for all-hydraulic 360-deg control. *The Lodge & Shipley Co.*

Circle 13 on postcard for free copy

Power Tools

Catalog No. 537 describes a line of portable power tools. *Syntron Co.*

Circle 14 on postcard for free copy

USE THIS POSTCARD

Fork Lift Truck

Now available is Bulletin No. 1462 describing in detail features of FT Series fork lift truck. *The Buda Co.*

Circle 15 on postcard for free copy

Thermostats

Bulletin CMH-129 covers Flexon thermostats. *Flexonics Corp.*

Circle 16 on postcard for free copy

Rubber Bearings

Recently published is a 33-page catalog on the uses of Goodrich Cutless rubber bearings in industrial equipment. *Lucian Q. Moffit, Inc.*

Circle 17 on postcard for free copy

Cutting-Off Blades

Recently released is Circular No. 561 on a line of cutting-off blades for production applications. *Pratt & Whitney, Div. Niles-Bement-Pond Co.*

Circle 18 on postcard for free copy

Flock Uses

Recently released is a 12-page bulletin on the uses and methods of application for decorator flock. *Celusuede Products, Inc.*

Circle 19 on postcard for free copy

Cleaning Barrels

Bulletin No. 223-A has been revised to include data on the three and 18 cu ft capacity Blastmaster barrels. *Pangborn Corp.*

Circle 20 on postcard for free copy

Materials Handling

Now available is a revised edition of a booklet on cutting materials handling costs. *Yale Materials Handling Div., The Yale & Towne Mfg. Co.*

Circle 21 on postcard for free copy

Turret Lathe

Ready for release is Bulletin No. 145 on the 3-U Speed-Flex automatic turret lathe. *Potter & Johnston Co.*

Circle 22 on postcard for free copy

Gaging Cartridges

Ready for release is a 24-page booklet on applications of Plunjet gaging cartridges for use with Precisionaire and other makes of air gages. *Sheffield Corp.*

Circle 23 on postcard for free copy

Cleaning Equipment

Bulletin No. 424 covers hydraulic jet cleaners for plant and machinery clean-up. *Sellers Injector Corp.*

Circle 24 on postcard for free copy

Crucible Furnaces

Bulletin No. C-2 is on gas crucible furnaces for melting non-ferrous metals. *Eclipse Fuel Engineering Co.*

Circle 25 on postcard for free copy

(*See preceding page*)

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ADDRESS ..... (No. & STREET) (CITY) (ZONE) (STATE)

This Memo Concerns You

COPPERWELD STEEL COMPANY
WARREN, OHIO

ARISTOLOY STEELS

INTERIOR CORRESPONDENCE **DATE** July 29, 1953

FROM Executive Vice President **TO** General Manager-Sales

SUBJECT Steel Alloy Leaded

BOB:

We have begun operating our new installation for producing electric furnace carbon and alloy steel with lead under the Inland license.*

I believe it is now in order to let our customers know that Copperweld can furnish leaded steels so that they can take advantage of its economies such as improved machinability, improved production and longer tool life.

One of our friends called yesterday to say that their trial of leaded 4140 annealed showed a machinability rating of 100 compared to 60-70 for the same steel not lead treated. This result while probably better than can be hoped for in every instance indicates the potential value that most users can expect in improved production.

C.W.H.

Send a copy of this memo to our sales offices in:

New York
Chicago
Tulsa
Cleveland
Detroit
Los Angeles
Houston
Seattle
San Francisco
Syracuse

RSC.

* Inland Ledloy License

NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 89

Roller Bearing

Recently developed for high-speed aircraft is a self-aligning, torque tube type, double-row roller bearing. It is said to provide full freedom of rotation under all conditions of misalignment resulting from mounting inaccuracies and the usual flexing of airframe structural members during flight.

Shafer roller bearing.

The DP Series bearing is factory-lubricated and equipped with positive seals which perform the two-fold duty of retaining lubricant and preventing air loss in pressurized aircraft. *Shafer Bearing Corp.*

Circle 26 on page 89 for more data

Ram Air Turbine

Recently announced is a ram air turbine that supplies emergency hydraulic power for jet aircraft in event of an engine failure either at high speed or landing speed. It can be extended into the air stream or installed in the main air duct.

At Mach 1, the speed of sound, the turbine is said to reach full power in less than a second, and at an airspeed of 130 knots, an approximate landing speed, it reaches full power in three sec, according to the maker.

The turbine wheel operates a pump which develops the necessary hydraulic pressure to operate the aircraft control system or other vital units whenever the main hydraulic power system fails. Its speed is automatically controlled.

The entire unit weighs 15 lb, is 12 in. in diameter, and occupies less than ¾ of a cu ft of space. *AiResearch Manufacturing Co.*

Circle 27 on page 89 for more data

Portable Starter Unit

Recently announced is the development of a portable starter unit in the form of a detachable wing container for use on tactical aircraft.

Under operating procedures, the self-contained gas turbine compressor is ferried by an airplane to a forward combat base. There it is disengaged and used as a ground starting cart so that the plane can dispense with a built-in starter.

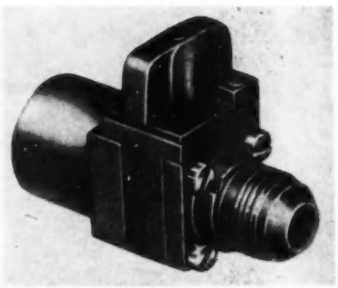
Douglas starter unit.

The pneumatic unit contains a two-stage centrifugal compressor with a single-stage radial flow turbine. It has its own electric starter and fuel and lubricating systems.

The starter package is housed in a tear-drop container which mounts on the bomb racks; its 500 lb include the compressor, battery, and fuel tank.

For ground usage, the unit has a swivel nose wheel to which is attached a manual towing handle that actuates a wheel brake when released. Stowage space for the wheels and handle, as well as pneumatic lines, is provided within the container. *El Segundo Div., Douglas Aircraft Co., Inc.*

Circle 28 on page 89 for more data



Koehler ball drain valve.

Ball Drain Valves

Recently introduced is a series of ball drain valves for handling fuels, gases, water-alcohol, and corrosive fluids. They are available in three sizes in two classifications: small, for ¼, ⅜ and ½-in. OD tubes; and large, for ⅝, ¾ and one-in. OD tubes.

Some of the units may be used as manual shut-off valves in fluid lines. If desired, valve shafts providing for remote actuation may be obtained. The valves may be used at pressures up to 100 psi and up to 500 psi with Teflon seals. *Koehler Aircraft Products Co., Inc.*

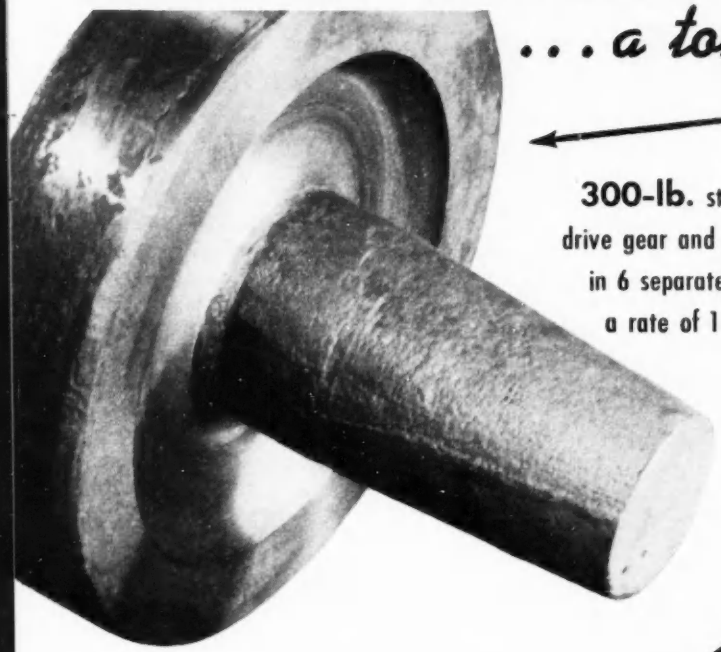
Circle 29 on page 89 for more data

Plastic Tubing

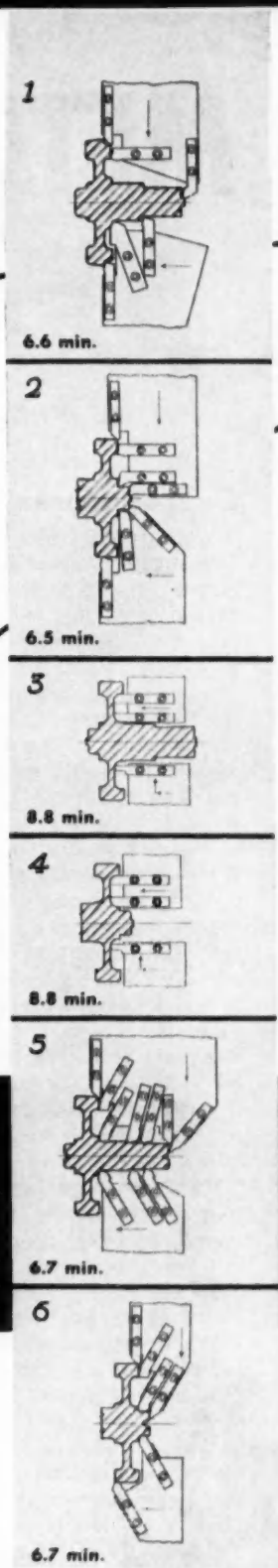
Recently developed is a plastic tubing to meet military requirements. Known as Airflex No. 6904, it is said to provide high flexibility at low temperatures coupled with fungus resistance. *Fibron Div., Irvington Varnish and Insulator Co.*

Circle 30 on page 89 for more data

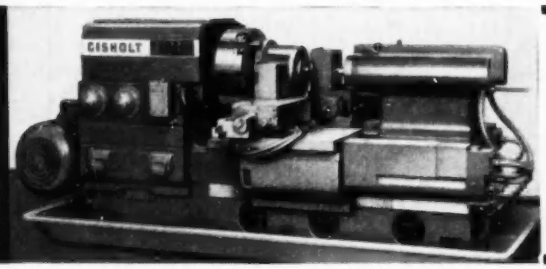
here's A JOB ...a tough one!



300-lb. steel forging for final drive gear and shaft—machined in 6 separate operations—at a rate of 1 finished piece per hour.



here's THE MACHINE ...that licks it!



GISHOLT
No. 24 Hydraulic Automatic Lathe

Here's how Western Gear Works of Belmont, California, solved their problem:

With two longitudinal carriages and two transverse tool slides, the standard No. 24 machine has the flexibility to combine rapid traverse and feed in several directions. Hydraulic controls make it very simple to change setups.

Now, note how tooling costs were cut by using mounting plates instead of special slotted tool blocks. Large tool bit shanks are slotted, and thus are easily set before final bolting down. The complete riser blocks are quickly interchanged for various operations. And here, again, Gisholt's traditional power and rigidity show up on cuts that pull up to 80 h.p.

For low costs on tough jobs, think first of the Gisholt No. 24 Hydraulic Automatic Lathe. Write for literature.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

METALS

New Pricing System for Zinc Introduced. Buying of Lead Tapers Off as Cost Rises. Nickel Controls May Be Eased.

By William F. Boericke

Copper Market Unsettled

When trading was resumed on the London Metal Exchange on August 6 after a lapse of 14 years, the copper price promptly collapsed to the New York equivalent of 26½ cents per lb. This was not unexpected. A domestic smelter had previously quoted 28½ cents for Valley copper. Subsequently the London price rose a bit so that it was about on par with New York after allowing for freight and handling. Generally speaking, there was less weakness than feared abroad. It appears that British copper consumers had run their inventories pretty low and had to replenish them.

The real worry for the copper trade was Chile. Would that country finally capitulate and accept the world price instead of the 36½ cents demanded and obtained for nearly a year, and would Washington take over some 65,000 tons of Chilean copper for the stockpile and remove it from a very nervous market? No answer was forthcoming up to the middle of August.

Sensing the uncertainty, custom smelters began to reduce the price they would pay for No. 1 scrap which fell to 21½ cents per lb. Allowing for conversion cost, this indicated about 24½ cents per lb for electrolytic, substantially under the 29.6 cent average for most sales up to August 15.

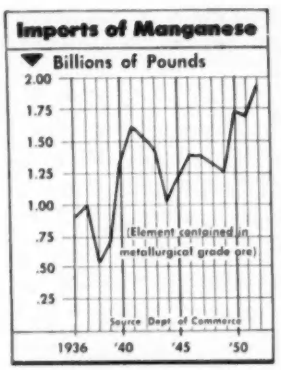
With the single exception of one important large copper producer, belief is general that copper prices are headed lower. Copper futures reflect this and 1954 deliveries are quoted about 23½ cents on the New York Commodity Exchange. Some confidence is felt that the price won't sink below the old OPS ceiling of 24½ cents, as a tariff of two cents per lb would automatically be imposed if foreign metal were offered for a month's time at 24 cents or less. Copper imports at present are at a very high figure. For the first five months of 1953 they have averaged 53,000 tons per month, against a monthly average of 36,600 tons in 1952. July deliveries were lower because of the usual vacation period but no more than expected. However, consumers were not buying ahead except at price concessions.

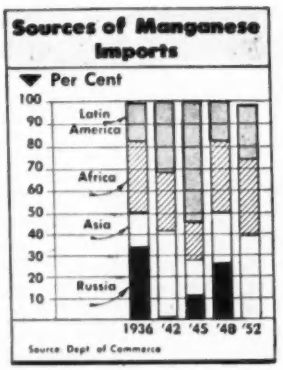
New Pricing Basis for Zinc

The 50-year old basing point system for pricing zinc went out of the window July 16 when American Smelting & Refining Co. threw a bombshell into the staid, if unhappy zinc industry, by announcing it would henceforth abandon the traditional East St. Louis base price in selling zinc with freight from that point to the consumer's plant paid for by the buyer. Under ASARCO's new pricing system the big smelter would sell Prime Western grade zinc at 11¼ cents per lb to all points east of the Continental Divide, and at 11½ cents west, with freight paid by the smelter.

While ASARCO apparently raised the zinc price ¼ cent, from 11 to 11¼ cents, actually the effect was to lower the price to important consumers in Pittsburgh, the Connecticut Valley and the Pacific Coast. The 11¼ cent price compared with 11.6 cents per lb for Pittsburgh buyers and 11.83 cents for New York and Los Angeles users under the former basing point system, which included the freight charges now absorbed by sellers.

ASARCO's decision caused widespread confusion and no little resentment among other producing interests, but most of them followed suit. Action, however, was not unanimous. For example, American Zinc Co. declared it would hold to the traditional East St. Louis basis, but would absorb freight if the transportation cost more than 50 cents per cwt. Ore buying schedules, many of which are based on the old system, were especially disrupted and some miners feared that today's generally unprofitable price for concentrates would be further cut as a result of ASARCO's move.





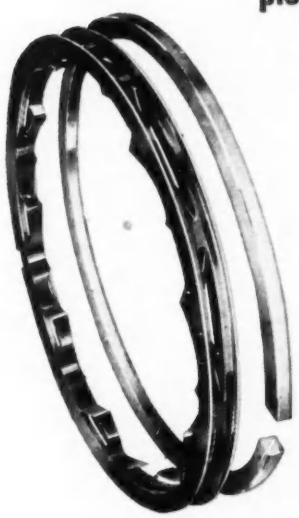
Foreign Zinc to Encounter Effective Competition

Not the least important result will be to place a roadblock in the path of sellers of foreign zinc on the Atlantic seaboard. With Prime Western zinc at 11.83

(*Turn to page* 127, *please*)

Willys

One of the many leading engine manufacturers to select and distribute Perfect Circle's 2-in-1 chrome piston ring set for authorized replacement service



2-in-1 is the truly modern piston ring equipment, controls oil—seals compression for over twice as long as old style sets. Solid chrome protects both oil rails and top compression rings against wear. And only 2-in-1 offers a choice of spring pressures with each oil ring to meet any cylinder wear condition.

For sustained power and positive oil control for thousands of extra miles, always install Perfect Circle 2-in-1 piston ring sets. Perfect Circle Corporation, Hagerstown, Indiana; The Perfect Circle Co., Ltd., Toronto, Ontario.

Perfect Circle

PISTON RINGS The Standard of Comparison

Observations

By Joseph Geschelin

New Engines

Judging by what we hear there should be quite a number of new engines for 1954, more than we had anticipated. We don't know definitely about the chances of seeing a Pontiac V-8 in 1954. It depends, no doubt, on the availability of special machine tools in sufficient numbers and on time, although much has been done by others in the same situation by improvization.

Piston Rings

Nearly everyone knows that a piston ring is not just a circular casting machined to form and thickness. It is actually a spring and requires a wealth of experience and know-how to make it behave properly in an engine. It occurs to us that the major piston ring suppliers have done an outstanding job for the engine producers not simply as ring suppliers but as organizations of skilled designers and inventors with an enormous background of experience and know-how. Moreover, the accumulated experience of the experts not just in years but in terms of exposure to varieties of engines spells unusual engineering aid when one is faced with a new engine design.

Investment Casting

Born of the war, investment casting, originally known as the lost-wax process, is finding more and more important applications. The big problem here is to find the right place in a given mechanism. For certain applications this foundry technique is certainly the most economical. How far the art has progressed may be judged by the growing business of the Cannon-Muskegon organization, a group of metallurgical experts who are developing a complete line of certified alloys for the investment casting industry. Known as the MasterMet alloys, this line includes the complete range of steels and alloys, alloy tool steels, ferritic and austenitic stainless, and super stainless alloys of nickel- and cobalt-base type. Produced in a new metallurgical plant with new equipment, emphasis is on specification quality with exceptionally close control. This operation is as significant to the buyers of investment castings as it is to the producers of castings.

Vacuum Effects

We hear that some recent experiences with new high compression engines indicate an important effect of engine vacuum on oil consumption. Up to now the piston ring has been blamed for high oil consumption in a new engine and rings can have an important effect, particularly with the current swing to a single oil ring. However, we are told that some test work has brought out the role of high vacuum quite dramatically. We have it third hand, but it seems that an experimental engine with automatic drive and showing good oil economy indicated a severe loss of economy when operated with a manual shift transmission. In fact, oil economy dropped 50 per cent. It is fortunate indeed that most of the new engines are intended for use with automatic drives.

Sintered Iron

You can add another very useful application of the art of powder metallurgy. Muskegon Piston Ring now has a setup at its Sparta, Mich., foundry for making small sintered parts. And they are supplying one of the major motor car companies with hundreds of thousands of small spacing rings — camshaft thrust washers — made of sintered iron alloy. This is a low stress application where sintered iron has long life and durability. Cost is most attractive, compared with a screw machine product, since very little machining is required, none at all on the OD.

Sintered Linings

With the increasing emphasis on big engines and high acceleration rates industry engineers are giving more serious attention to passenger car brake systems. On the larger and heavier cars, in particular, improvement in brake systems has become imperative with the advent of power brakes. In our travels we find that considerable work is being done with the adaptation of sintered brake linings for passenger cars. Experimental work is under way to develop powder metal mixtures suitable for this service. Sintered metal linings have some major advantages which have been known to engineers for some time. For one thing, they are relatively unaffected by high temperatures and, consequently, can be expected to operate without fading under most severe conditions. Moreover, they should be capable of making a series of emergency stops from high speeds without loss of effectiveness. The outcome of the current experimental program will be awaited with considerable interest.

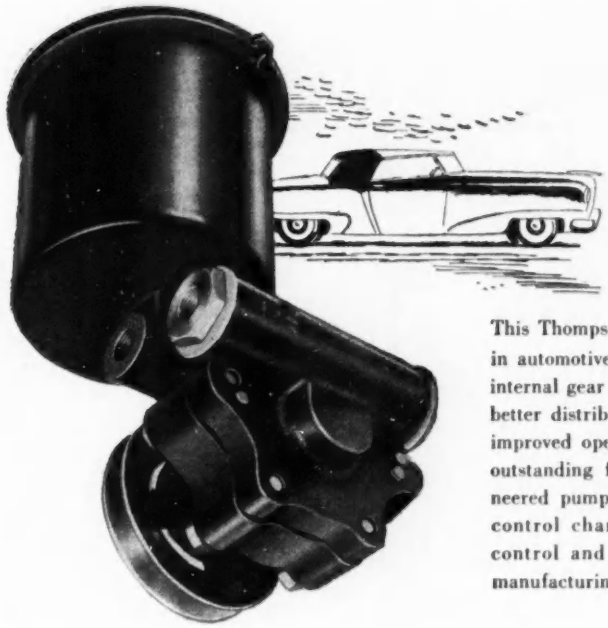
Pneumatic Equipment

Indications are that two major developments in the field of air equipment for motor trucks and buses are under way. The first of these—to come soon—is expected to be the first air brake system for light trucks, completely engineered for this kind of application. Later on we expect an announcement of an air power steering system suitable for heavy-duty trucks and buses.

Scientific Testing

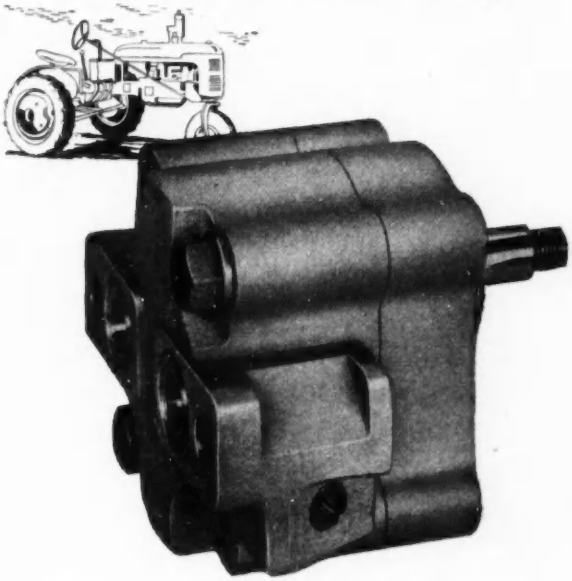
We are indebted to our friend S. D. Heron for a copy of an interesting historical publication, the "Scientific Determination of the Merits of Automobiles," by Dr. A. Riedler. The 1953 edition is a labor of love. It is pri-

(*Turn to page* 132, *please*)



This Thompson power steering pump for use in automotive power steering systems, is an internal gear pump with a more uniform flow, better distribution of driving pressure, and improved operating efficiencies. Among other outstanding features of this Thompson-engineered pump are quiet operation, flat flow control characteristics, combination flow control and relief valve, and competitive manufacturing cost.

Pump performance you can take for granted



Thompson's hydraulic pump used to actuate tractor implements features pressure loaded end plates, which compensate for wear and results in longer service life. This farm implement pump has a high discharge pressure—1200 P.S.I.—and high volumetric and overall efficiencies.

WHETHER it's a farm implement pump or a power steering pump, you can depend on Thompson for precision engineered pump performance.

Techniques and skills gained in manufacturing complex items, many with the closest tolerances, are applied to Thompson pumps—assuring maximum performance and dependability.

In addition to these pumps to actuate your farm implements and for use in your power steering system, Thompson also manufactures industrial pumps. Our engineers will gladly work with you to design pumps for your specific application. Write, wire or phone, Special Products Division, Thompson Products, Inc., 2196 Clarkwood Road, Cleveland 3, Ohio.

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SPECIAL PRODUCTS DIVISION

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

British Reveal New Jet Engine, Longer Life Ghost

Although still shrouded in mystery, announcement has been made by the De Havilland Engine Co. of a new axial jet engine, the Gyron, giving a much greater thrust than any other engine produced in the world. It is intended for supersonic fighter planes. Development work in connection with the new engine has been in progress for three years. It has undergone bench tests with, it is declared, a very high degree of reliability and low fuel consumption. All other information is withheld and the British government refuses to allow any picture of the engine to be published.

Operation for periods of 600 hours between overhauls has been officially authorized for the De Haviland Ghost engines used on the Comet planes in service with BOAC and the French Aeromaritime Transport Co. Following this official approval for 600 hours, a batch of BOAC engines commenced running a trial extension to 750 hours. At the end of June 1953 Ghost engines in service with the BOAC had completed over 60,000 hours and at present are flying nearly 5000 hours each month.

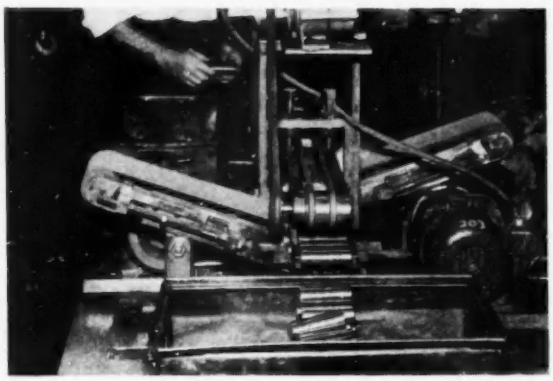
The Rolls Royce Avon RA-7R with afterburner with a gross rating of 9500 lb thrust has passed the 150-hour type-test, but is still on the confidential list.

Rolls-Royce is currently manufacturing nine different types of Avon engines, seven being of RA 7 rating and two of RA 3 and RA 9 rating. These variants of the basic Avon have been developed for fighter, bomber, naval and civil aircraft. Two further projected types are the Avon RA 14 and a civil engine of 9000 lb thrust.

Plant Safety Record

A new safety record for the Douglas Aircraft Co. has been established by the firm's Santa Monica Div. The plant recently completed more than four million man-hours without a disabling injury.

DEBURRS FASTER



Troublesome chamfering of piston pin ends was simplified with this machine devised at the Muskegon plant of Continental Motors Corp. Belt-fed pins are sandwiched between abrasive belts adustable for pin length and diameter. Machine handles up to 2000 pieces per hour.

Mich. College to Offer Automotive Curriculum

Western Michigan College, Kalamazoo, Mich., will open a curriculum in automotive transportation this fall.

The aim is to train people to become automotive service managers, salesmen, and to fill various supervisory and administrative positions in the manufacturing phases.

Jackson to Discuss Race Cars at SAE

Illustrated talks on Indianapolis race car design have been scheduled by SAE Sections for the coming months with Robert T. Jackson as the speaker. He will speak Sept. 28 at Peoria, Ill.; Oct. 2 at Milwaukee, Wis.; Nov. 11 at Philadelphia, Pa.; and April 13 at Albany, N. Y. Mr. Jackson represents AUTOMOTIVE INDUSTRIES each year at the Indianapolis Race and prepares a special engineering report on it for AI readers.

(*Turn to page* 118, *please*)

1953 NEW TRUCK REGISTRATIONS

Arranged by Makes in Descending Order According to the 1953 Six Months' Totals

MAKE	June 1953	May 1953	June 1952	SIX MONTHS Units 1953	SIX MONTHS Units 1952	SIX MONTHS Per Cent of Total 1953	SIX MONTHS Per Cent of Total 1952
Chevrolet	28,801	31,237	25,452	173,622	134,206	36.51	33.64
Ford	19,255	23,408	15,852	115,581	91,589	24.31	22.95
International	8,311	9,389	7,585	52,895	44,905	11.12	11.26
Dodge	6,695	7,338	8,620	46,664	47,348	9.81	11.87
G.M.C.	7,509	7,787	6,808	45,058	38,953	9.48	9.76
Studebaker	2,030	2,320	2,584	13,602	14,230	2.86	3.57
White	1,133	1,191	974	6,379	5,690	1.34	1.43
Willys Truck	641	762	977	4,992	5,300	1.05	1.33
Willys Jeep	793	832	696	4,738	3,998	1.00	.98
Mack	580	572	606	3,403	3,564	.72	.90
Reo	262	326	268	1,678	1,527	.39	.38
Diamond T	258	362	224	1,701	1,812	.36	.45
Divco	263	248	216	1,229	1,524	.26	.38
Brockway	174	191	101	1,045	902	.22	.26
Autocar	185	183	128	919	799	.19	.20
Federal	114	58	57	505	392	.11	.10
Kenworth	56	34	42	351	351	.07	.09
Pontiac	40	46	41	233	286	.05	.07
F.W.D.	37	16	29	173	262	.04	.07
Peterbilt	16	1	20	77	118	.02	.03
Mis. Domestic	22	44	181	295	1,205	.06	.30
Misc. Foreign	23	19	10	144	171	.03	.04
Total—All Makes	77,199	86,366	71,471	475,484	398,932	100.00	100.00

* Based on data from R. L. Polk & Co.

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PISTONS

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CONSTANT CLEARANCE over the entire temperature range from −20° F. to 200° F. Closer clearances than ever before possible without danger of scuffing or seizing.

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STERLING ALUMINUM PRODUCTS Inc. SAINT LOUIS, MISSOURI

Cutting Abrasive Costs

(*Continued from page* 68)

satisfactory. The recommended speed, using a 36 grit aluminum oxide cloth belt, is on the order of 4200 sfpm. If coarser grits or higher speeds are used, a pulling rather than a sanding operation occurs, and a poor finish is obtained.

One of the illustrations shows the sanding of solder seams under the rear tail lights with a Buckeye belt sander, using a 36 grit solder sanding belt. When slack-of-belt is applied, the tool permits the contour to be followed more readily. The tool also eliminates swirls obtained with conventional sanding disks.

A belt sander, which permits the use of abrasive belts on straight-spindle air and electric portable tools, is the Port-A-Belt grinding attachment. This machine, which consists of an idler pllley, a supporting mechanism and a contact wheel, is particularly suited for weld removal and the awkward, hard-to-get-at jobs encountered in automobile body fabrication.

Available in two sizes, one using a 20 by two in. belt and the other a 12 by one in. belt, the portable belt sander has replaced setup wheels and conventional sander disks in a number of applications. With it, operating costs have been reduced 50 per cent in some cases due to the fact that more abrasive surface is available, and the entire surface is utilized. Freedom from chatter, smoothness of finish, and ease of handling are other features which add to the usefulness of the sander.

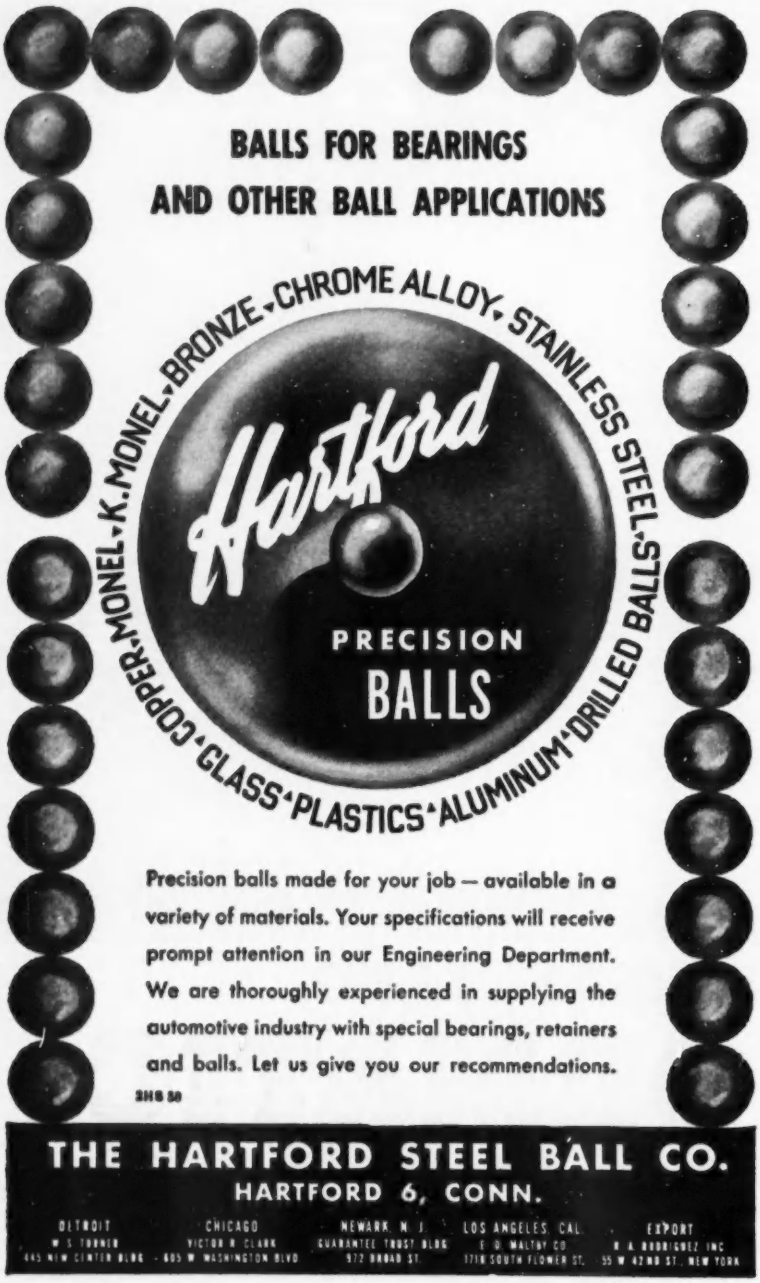
During the time of the steel shortage, for example, when two-piece hoods and roofs were being manufactured, the Port-A-Belt was used very successfully on the finishing of the weld. The smaller unit also lends itself in the cleanup of door facing and other small areas where solder is present.

Both grease sticks and cutting oils have been used in conjunction with belt sanders to minimize loading, particularly in the sanding of solder. In the case of especially soft grades of solder, open-coat belt cloth can be used with success.

On the subject of wet sanding, the question generally arises of hand sanding vs. machine sanding. The hand sanding method still predominates in the automobile industry, although rapid advances have been made, in recent years, in machine sanding techniques.

Hand sanding is generally considered most suitable for sanding drip rails, pillar posts, instrument panels, and other areas where sharp corners and difficult contours exist. Machine sanding, on the other hand, is usually regarded best for flat surface body areas.

Proponents of the hand method concede that use of machines reduces operator fatigue slightly, but they feel that this advantage is outweighed by the hand method from a cost and performance standpoint. Increased abrasive consumption has been experienced in some plants when going from the hand method to oscillating machines. This has been traced to (1) tearing of the coated abrasives when the machines strike against body burrs, drip rails and similar objects, and (2) the fact that operators insert more abrasive into the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AND OTHER BALL APPLICATIONS
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Precision balls made for your job — available in a variety of materials. Your specifications will receive prompt attention in our Engineering Department. We are thoroughly experienced in supplying the automotive industry with special bearings, retainers and balls. Let us give you our recommendations.
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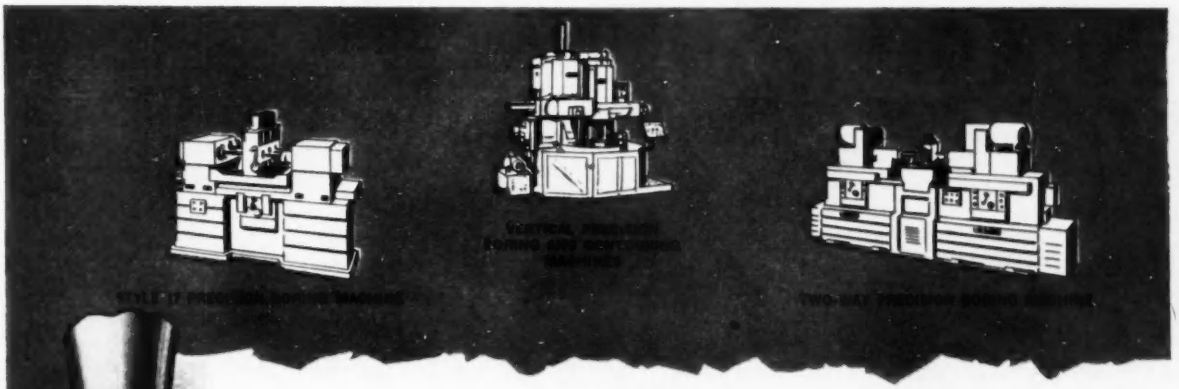

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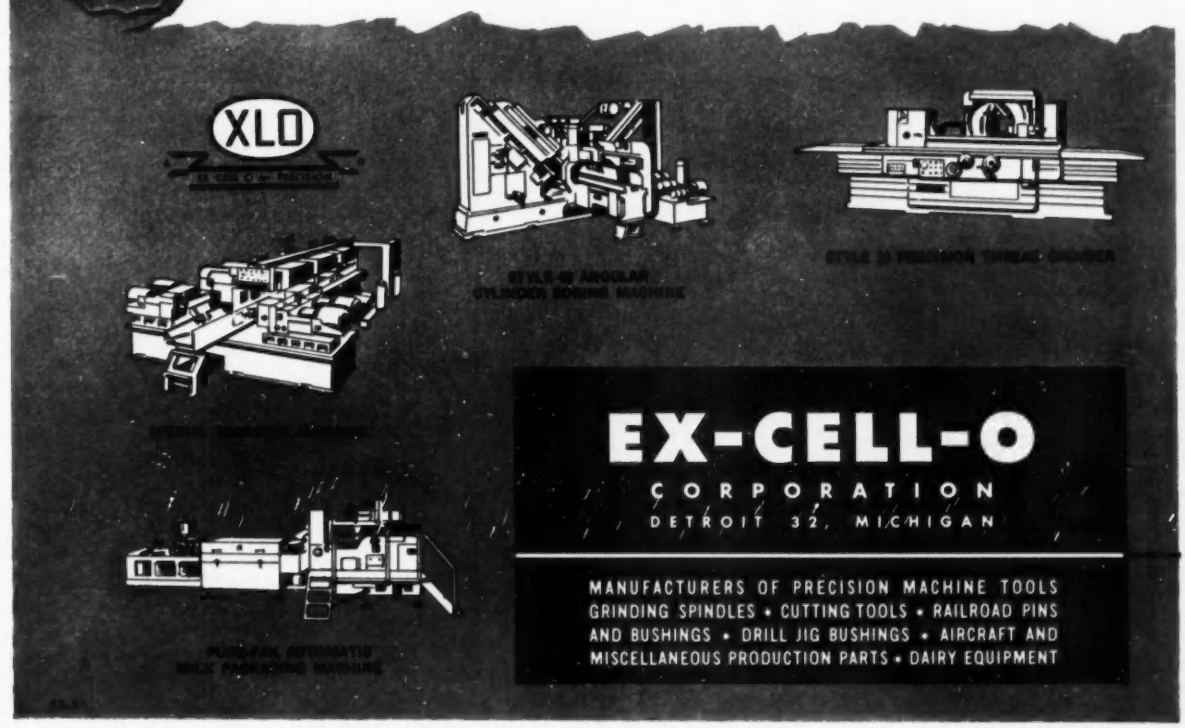

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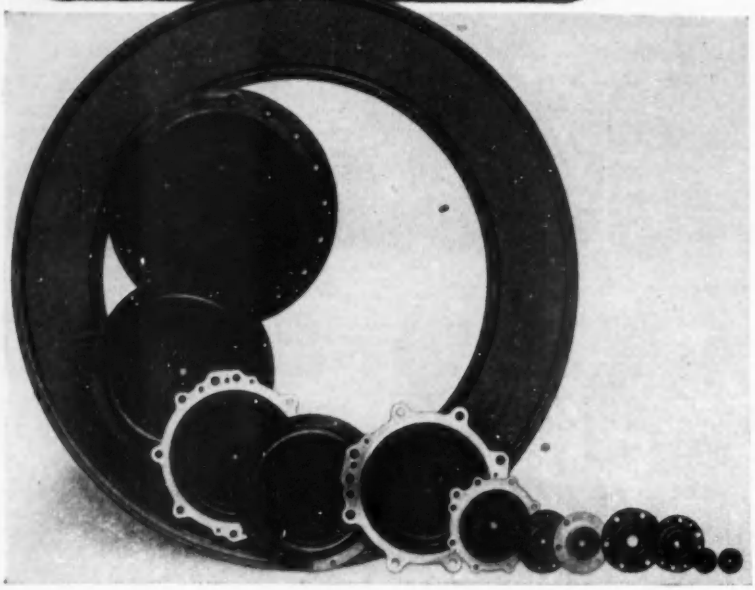
DIAPHRAGMS



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machine than can be completely utilized.

Performance-wise, the hand method is said to be better because the operator can "feel" the work imperfections. This can actually reflect as a drawback due to the possibility of finger marks caused by inexperienced personnel. Such a possibility can be minimized, of course, through the use of a hand block.

In many cases where cloth abrasives are used for hand sanding in the body shop, paper products can be substituted, with resulting decrease in abrasive cost. Abrasive material commonly referred to as emery cloth finds many uses, in removing file marks, blending disk marks, scuffing, etc. If this type product is preferred, an aluminum oxide electrocoated metalworking cloth, in the required grit size, is recommended Cabinet paper with aluminum oxide coating has replaced the cloth product in a number of applications, with savings achieved of up to 50 per cent. A point to note when substituting paper for cloth, is that the grit used should be one grit size finer.

In many assembly plants dry hand sanding is performed with waterproof paper. This is an unnecessary expense, because waterproof paper is intended for wet sanding (and for use with Flexbac and Pastcut pads) and therefore contains special costly treatments in its manufacture.

To permit more extensive use of dry sanding operations, Carborundum has developed a finishing paper with an open-coat coating which reduces loading to a minimum. Moreover the performance of the dry product at least equals that of waterproof paper, with an initial cost of only about half that of the waterproof type.

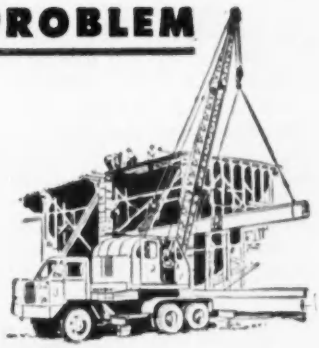
Fastcut waterproof paper, which has an aggressive abrasive action and a high rate of water absorption, has been developed by Carborundum for sanding materials such as prime, prime surface, sealers and other types of undercoats which have a tendency to powder when sanded. It can be used on most undercoats, with little or no soaking and is at its maximum efficiency after soaking for only three minutes. While hand sanding is generally applied to sharp corners and difficult contour areas, certain prime coats lend themselves best to hand sanding techniques.

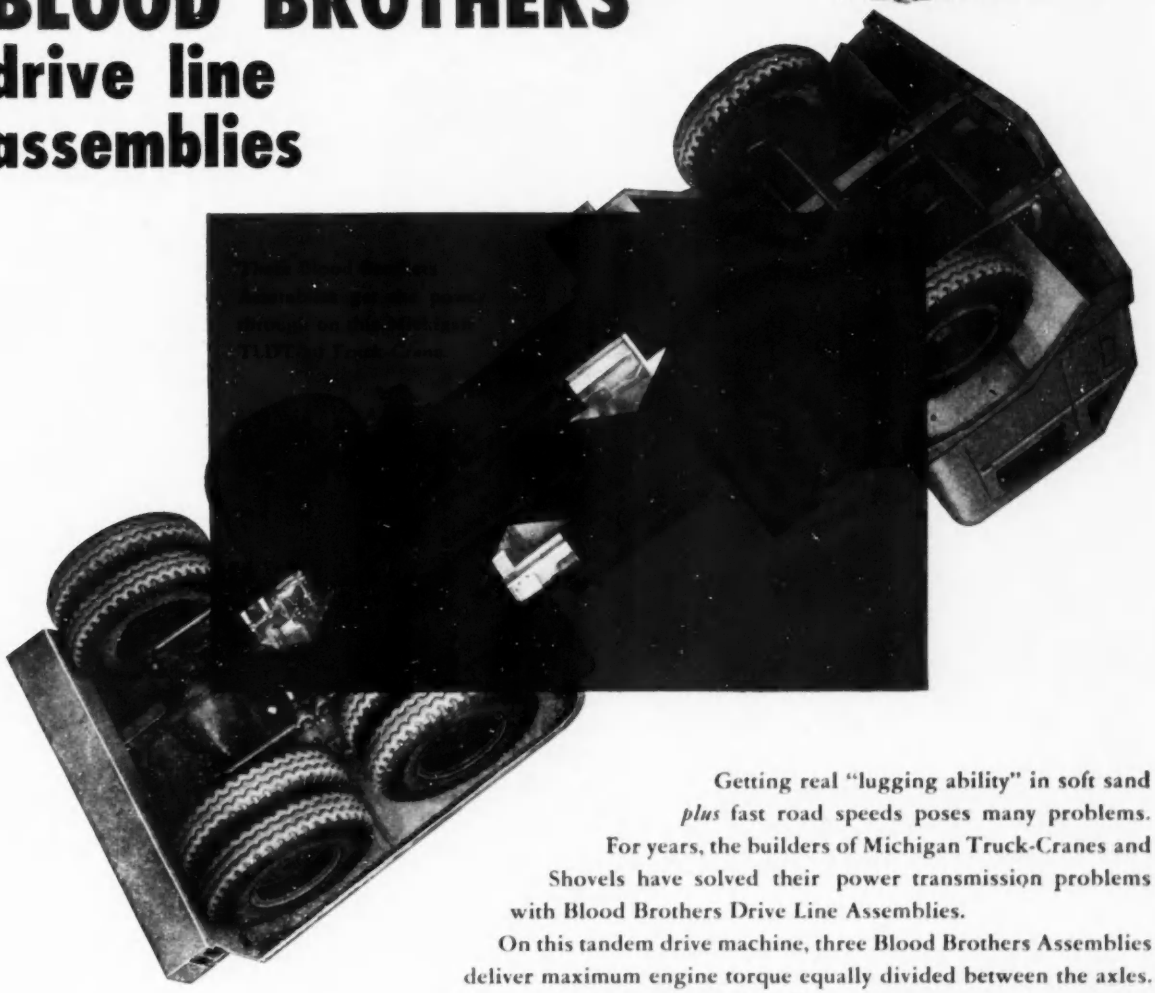
Red-I-Cut L paper, on the other hand, is intended where maximum dry flexibility is desired and is generally used for sanding lacquer on final color coats to remove orange

ANOTHER POWER TRANSMISSION PROBLEM

SOLVED for SURE

with BLOOD BROTHERS drive line assemblies





Getting real "lugging ability" in soft sand *plus* fast road speeds poses many problems. For years, the builders of Michigan Truck-Cranes and Shovels have solved their power transmission problems with Blood Brothers Drive Line Assemblies.

On this tandem drive machine, three Blood Brothers Assemblies deliver maximum engine torque equally divided between the axles.

When *you're* faced with a power transmission problem, call on our engineers. Chances are, they'll help you "solve it for sure!"

BLOOD BROTHERS machine co. ALLEGAN, MICHIGAN

UNIVERSAL JOINTS AND DRIVE LINE ASSEMBLIES

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peel. It requires little soaking and has excellent flexibility even in the dry state. In the sanding of the softer varieties of undercoats, Red-I-Cut L paper is more satisfactory than Fastcut.

In an effort to achieve economy, some automotive assembly plants employ used wet papers as substitutes for the finer grit sizes used in repair work. Others have resorted to soaking worn wet paper, drying it and using it on the repair line. This latter technique is not very practical, however, because direct labor costs offset savings in material.

In some plants abrasive consumption has been greatly reduced through the technique of sanding drip rails, pillar posts and similar areas (where abrasive paper is usually discarded before maximum use has been obtained from it) with abrasive paper previously used on door panels, fenders and the like.

Substantial savings can also be achieved—on the order of ¾¢ per equivalent nine by 11 in. sheet—by the plant cutting its own coated paper. The coated abrasives manufacturer must add such charges to cover the cutting costs and special requirements. A method of handling such a procedure is to have the material cut in the general stores department of the plant and then issued to plant personnel as needed.

Digital Computer

(*Continued from page* 57)

Is the problem now organized for automatic computation? If not, who will organize it? How much judgment enters the present procedures? How can this judgment be formulated for an automatic calculator? How often do existing empirical functions have to be extrapolated?

3. Consider the mathematical tools for solving the problem.

Do you know methods of numerical solution exist within the organization? If not, what is the likelihood that they exist elsewhere? Is it likely that new methods can be developed at reasonable cost?

4. Consider the personnel required.

Will the calculations use repetitive or non-repetitive procedures? How much and what kind of personnel will be required? Is the required personnel already in the organization or will outside talent need be hired? If new talent is needed, is it available at reasonable salaries? What will be the total cost of personnel? Is floor space available for the machine and the needed personnel?

5. Consider the kind of computer required to do the job. Will a small, medium, or large computer be required? Which make of computer has design and operating characteristics best suited to the particular job? Does outright purchase or rental seem more attractive? Who will maintain the machine? What will maintenance cost?
6. Make an economic appraisal of the entire proposal.

List the results which automatic calculation will likely accomplish. Review the means by which competent personnel will be obtained. Review the probable cost of the computing machine together with its associated personnel.

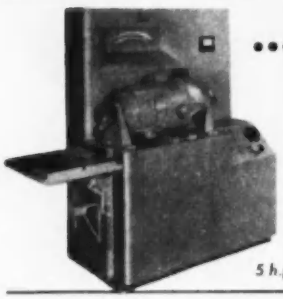
Set down the accomplishments and shortcomings of present methods. Tabulate the costs of present methods.

(The foregoing article by Mr. Keller is an abstract of a paper presented by the author at a recent Detroit management conference of the American Society of Mechanical Engineers.)

ONE for the money!

You'll get more for your money when you install a Nankervis dynamometer in your testing department. That's because you'll get one designed to fit *your* job. It will be easy to operate, have only approved components, look better, too.

1/10 h.p.—20,000 RPM.



...TWO for the show!

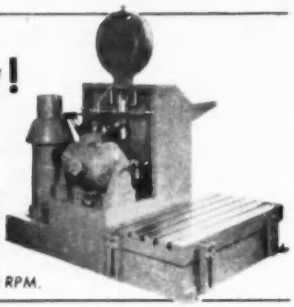
Your Nankervis dynamometer will show you what to expect from generators, starters, tachometers, speedometers, hydraulic pumps for power steering — window and top raisers — and automatic transmissions — and many other rotary devices. Too, you'll be able to determine frictional losses of steering gears, wiper motors, differentials, as well as complete power plants.

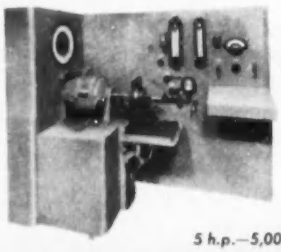
5 h.p.—16,000 RPM.

...THREE to get ready!

We are ready to supply you with any kind of dynamometer with a choice of loadings: mechanical, electric, or hydraulic. It will be statically and dynamically balanced — have a one-knob speed control — an adjustable work table — and electrical controls built to JIC specifications.

5 h.p.—4,000 RPM.





...and FOUR to go!

Go to Nankervis for all kinds of special equipment for testing complete engines, hydraulic components, electrical accessories, and similar electro-mechanical devices. Your Nankervis representative will show you new ideas in testing.

5 h.p.—5,000 RPM.

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The new EVANS ED-75

Provides more heat output than any other heater-defroster of its size

SMALL
only 8-1 16" x 8-5 16" x 8-3 8"

POWERFUL
17,800 BTU Output

EFFICIENT
split core and tank travel water further — heat lingers longer

HEAVY DUTY
"Continuous service" bus type motor — heavy duty truck service core

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Simple to connect to top or side cowl for fresh air intake

Each Evans unit is custom engineered for its specific vehicle installation, to provide a completely satisfactory heating and ventilating system. Evans units are available for a wide variety of commercial vehicle applications.

The Evans organization is staffed to engineer units to specification, organized to build prototypes quickly, equipped to conduct precision tests to latest A.S.H.V.E. procedures. Military experience dating back to World War I qualifies Evans to work with you in meeting the rigid specifications of the Armed Forces. If your needs are for high performance, ruggedly constructed equipment—it will pay you to consult Evans Products Company, Heating & Ventilating Division, Dept. P-9, Plymouth, Mich.

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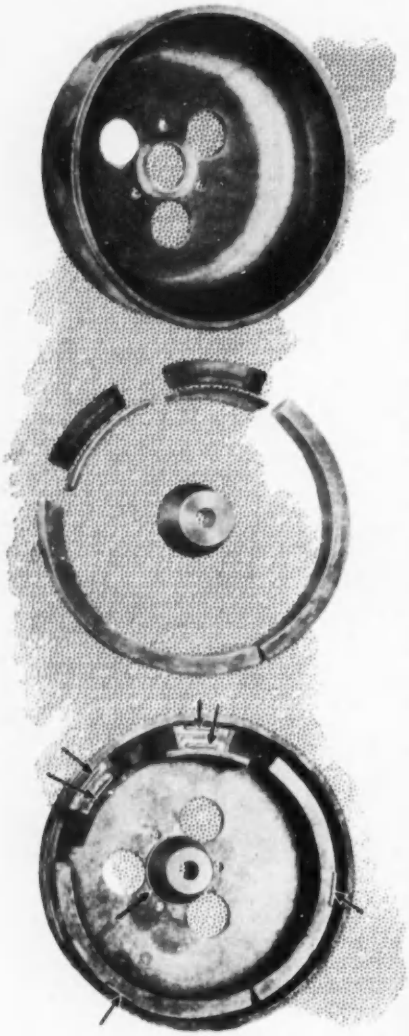
Precision die-molded airfoil section blades . . . move more air with less noise and current draw . . . will not chip, crack or bend . . . unaffected by temperature . . . one piece construction.

EVANS — BALANCED HEATING & VENTILATING **CUSTOM HEATERS** FOR EVERY TRUCK AND BUS

YOUR LOW-COST WAY TO GET HIGH-STRENGTH METAL ASSEMBLIES

...braze with EASY-FLO

● In designing metal assemblies, don't fail to consider EASY-FLO brazed construction. It will pay you, because this widely used method of assembly assures, not only one-piece strength, but also — fast, low-cost production. That's why thousands of parts are now designed from scratch for EASY-FLO brazed construction — and thousands more, originally cast or assembled with threads, are redesigned to get the benefit of the great strength, speed and economy of low-temperature EASY-FLO silver alloy brazing. Here's a typical example—from R. E. Phelon Co. Inc., East Longmeadow, Mass.—a flywheel magneto—formerly a costly non-magnetic casting — now an economical EASY-FLO brazed assembly, strong as solid metal.



Hub, 2 steel counterweights, 2 pole pieces and 2 magnets are jigged in stamped shell and gas-air brazed, with EASY-FLO ring and wire pieces preplaced. Heating time per magneto, 2¼ minutes. Production, per 4-man, 8-hour shift averages 220.

BULLETIN 20 gives you the whole EASY-FLO brazing story in detail—plus information you can use about joint design and fast production brazing methods.

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Turning Crankshafts

(*Continued from page* 51)

one of the faces is inaccessible to the front slide tool. Hence they have provided a vertical back tool attachment which is hydraulically operated and arranged to come in at the proper time with an automatic cycle.

Some impression of the quality control and dimensional accuracy of this operation may be gained from the fact that two controlling thrust faces located on opposite side of the crank—hence machined in different settings—are held to a total tolerance of 0.002 in. for spacing.

Since the two machines operate on automatic cycle and at exceptionally high rates of speed and feed, several important safety features are provided to prevent damage to the machine from certain accidental causes. First of all, it may be noted that the work is chucked simply and automatically. The machine with the special back arm is equipped with an air-operated chuck and is protected by provision of an air actuated switch designed to shut down the machine if air pressure is inadequate to hold the work. Similarly, each machine is fitted with an ammeter to warn of excessive tool wear.

Another noteworthy design feature is that provision of a vertical slide makes it possible for chips to fall freely onto the apron, thus preventing loading of the tool block and slide and facilitating chip removal.

BOOKS...

METAL CLEANING BIOGRAPHICAL ABSTRACTS, *edited by Jay C. Harris, published by American Society for Testing Materials 1916 Race St., Philadelphia 3, Pa. Price, $4.25.* These bibliographical abstracts are intended to make the published data on metal cleaning readily available to the many persons concerned with the production, finishing, and maintenance of metal products. References are arranged by year, and secondarily by author, or by the journal in which the article appeared if annonymous, and are numbered consecutively.

HANDBOOK OF NOISE MEASUREMENT, *by Arnold P. G. Peterson and Leo L. Beranek, published by General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass. Price, $1.00.* This handbook, consisting of over 100 pages, covers thoroughly the measurement of airborne sounds, including definitions, standards, measuring equipment, procedures, and interpretation of results. The authors are well known in the field of acoustic measurement.

STAINLESS STEEL FOR BUILDINGS

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For the product you make
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plan for tomorrow.

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Manufacturers of Stainless and Carbon Steels

So its an autumn CLOUDBURST!

So what...with INLAND Self-Sealing WEATHER STRIP?

The autumn rainstorms drench the truck or bus. THEN is when flooding trickles enter around glass sealed with cement, binders, metal strips . . . *ordinary* methods.

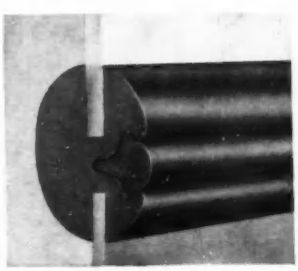
But NOT where Inland Self-Sealing Weather Strip is used! Its *natural* sealing principle . . . assures *complete* weather protection at *every* point. That's why so *many* trucks, buses, cars, other vehicles and structures, use Inland Self-Sealing Weather Strip.

Inland Self-Sealing Weather Strip is best for the *builder* . . . a fast, one-man, low-cost installation. And best for the *user* . . . long-lived, trouble-free, inexpensive when replacing broken glass.

INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio

Here's how it works!

Inland Self-Sealing Weather Strip goes into body panel or other opening . . . glass into Strip . . . filler strip into locking channel. A *compression seal that's complete and permanent.*



INLAND MANUFACTURING

Self-Sealing WEATHER STRIP

SIX MONTHS REPORTS—AT A GLANCE

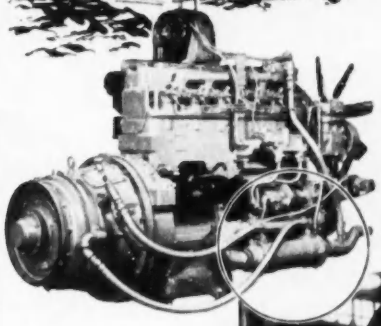
Period ending June 30

CARS, TRUCKS, ENGINES	Sales (millions)		Net (millions)	
	1953	1952	1953	1952
ACF-Brill	12.7	10.8	.48	1.19
American Locomotive*	153.4	100.1	2.74	1.87
Autocar	17.3	16.3	.11	.21
Briggs & Stratton			1.71	1.21
Chrysler	1874.2	1256.0	44.13	43.68
Continental Aviation**			.11	.22
Diamond T	41.9	37.5	.45	.53
General Motors	5441	3869	312.84	269.40
Federal Fawick	10.1			
Fruehauf	105.3	86.5	3.71	3.00
Hudson			1.88	4.11
Mack	88.4	83.1	1.25	1.34
Nash-Kelvinator	387.8	268.8	15.12	8.74
Packard	222.2	96.8	6.02	3.09
Pressed Steel Car	49.8	24.1	1.66	.95
Reo	77.0	79.0	1.66	1.92
Studebaker			2.36	
Twin-Coach	16.4	25.1	.29	.53
White	77.1	81.0	1.96	1.65
SUPPLIERS				
Alcoa	361.4	277.4	27.13	23.23
American Brake Shoe	38.4	35.6	1.49	1.28
Auto-Lite	154.1	132.4	5.71	5.00
Bendix*	167.6	139.3	4.02	3.79
Bohn Aluminum & Brass	34.8	23.6	.81	.42
Borg-Warner	202.5	185.2	10.84	10.86
Breeze Corp.	8.8	7.8	.27	.15
Budd	184.6	145.6	5.53	5.20
Bullard	34.3		2.22	1.12
Campbell, Wyant & Campbell	17.8	16.6	.72	.66
Clark Equipment	64.8	74.0	3.07	3.29
Clevite	37.6	27.1	2.01	1.78
Dow Chemical#	430.3	407.1	35.85	35.81
Evans Products	14.2	10.6	.50	.14
Federal-Mogul	18.1	18.1	1.40	1.25
Gabriel	11.2	7.9	.28	
General Tire	98.3		3.48	2.94
B. F. Goodrich	350.3	297.2	16.87	14.90
Goodyear	616.3	568.8	22.99	15.48
Hayes Manufacturing	15.3	13.6	.48	.40
Michigan Bumper	2.8	2.4	.19	.11
Minnesota M&M	106.2	88.0	26.60	20.00
Motor Wheel	47.6	34.3	1.64	1.41
Seiberling	20.9	19.6	.52	.43
Stewart-Warner	67.3	62.2	2.14	1.80
Thompson Products	169.4	123.4	5.35	3.81
Tung-Sol	20.7	15.4	1.01	.88
U. S. Rubber	453.8	443.4	14.44	12.95
Vanadium Corp.	24.1	17.4	1.64	1.06
Westinghouse	69.3	45.3	4.91	5.39
AIRCRAFT				
Bell	74.9	58.5	1.89	.89
Boeing	418.9	309.3	9.17	5.87
Fairchild	84.1	51.3	2.10	1.22
Gruman	125.1	108.3	3.67	2.16
Glen L. Martin##	70.9	66.1	4.50	.54
North American★	460.7	204.2	7.99	5.20
Temco	27.5	25.0	.90	.86
Republic	188.2	134.5	3.73	2.62
Solar★★	69.4	52.2	2.80	1.44
United Aircraft	408.5	323.6	12.33	8.60

*3 months **6 months Apr. 30 #year May 31
##before taxes ★9 months ★★year Apr. 30

YOUNG COOLS THE WORLD'S LARGEST TRUCK

Above: Dart 60—the world's largest truck . . . cooled by Young Radiators and Young Heat Exchangers.



Left: One of two Young Type "F" Shell and Tube Heat Exchangers (circled) which cool Diesel fuel circulating through twin torque converters.

Right: Two Young standard-type "Mono-Weld," welded steel, Radiators which cool dual 350 hp Diesel engines. They feature special heavy headers of reinforced steel, with supply and return tanks bolted together. Reinforced with X cross members as a frame.

Whether your requirements vary from lightweight, efficient Stamped Tank Radiators to huge, rugged welded steel units, Young can design and manufacture the equipment needed to provide the proper heat transfer. Where combinations of jacket water, lube oil, torque converter fluid, supercharger air, compressed gases, etc. must be cooled, Young offers a *single source* for units *engineered to work together.*

YOUNG RADIATOR COMPANY

Dept. 103-J, Racine, Wisconsin
Plants at Racine, Wisconsin and Mattoon, Illinois

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Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Applications

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O&S BEARING & MFG. CO.

777 W. EIGHT MILE ROAD • WHITMORE LAKE, MICHIGAN

Caterpillar Oil Type Tractor Clutch

(*Continued from page* 69)

high temperature operations found in the type of earthmoving work for which these machines are used.

Since friction material operating in oil has a much lower coefficient of friction, the engaging force of an oil clutch must be higher than an equivalent dry clutch. On this account, Caterpillar has developed an engaging mechanism with a very high mechanical advantage and has specially hardened all of the highly loaded internal parts to reduce the pull required by the operator on the clutch handle. On the D8, the largest tractor Caterpillar makes, a booster cylinder has been added to engage and disengage the clutch. This gives greater ease of control and also provides a short clutch lever stroke on this model. The D6 and No. 6 shovel do not require this booster.

An innovation being introduced with this clutch is a universal joint which eliminates the need for close alignment between the clutch and transmission.

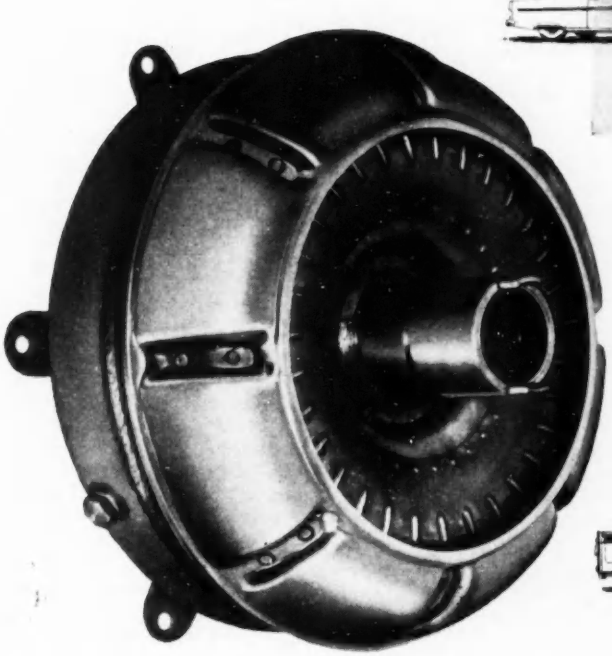
Forming Exhaust Pipes

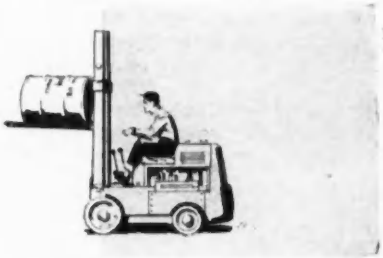
(*Continued from page* 72)

multiple bends in a single setup. Because of the extra clearance on both sides and in front of the press, it has been possible to design the workpieces with fewer radii and complete most jobs with fewer setups and less work handling.

Faster setups are made possible by a single screw wing die adjustment which eliminates the old problem of equalizing die holder settings, and a variable ram speed control which permits lowering the ram slowly and stopping dead at any given point for making depth-of-bend adjustments and die settings to duplicate a sample.

Here are a few of the typical results now being obtained at Maremont. The tail pipe, held by operator in one of the illustrations, requires four bends. The stock is 1¾ in. by 16-gauge CRS by 54 in. long. The first operation is a 30 deg bend, the second a 110 deg bend, and the third and fourth 25 deg bends, each on a four in. center line radius. All are now made in sequence on the machine





The LONG TORQUE CONVERTER is in Volume Production for...

- **INDUSTRIAL MATERIALS HANDLING TRUCKS**
- **AUTOMOBILES**

The Long Torque Converter provides smoother, faster, more economical operation for industrial trucks. Combined with a hydraulically-operated clutch it provides even greater flexibility in use.

Available in 11- and 12-inch diameters, for engines ranging from 90- to 200-lbs-feet torque, the Long design is easily modified for a wide variety of other applications. Its design, incorporating use of economical stampings and leakproof welding, assures *low* cost.

To prospective users of converters in these capacities, we offer low cost production and our complete engineering cooperation.

LONG MANUFACTURING DIVISION • BORG-WARNER CORPORATION
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50 Years
of Quality Manufacturing for the Automotive Industry

LONG

ENGINEERING B-W PRODUCTION

TORQUE CONVERTERS • CLUTCHES • RADIATORS • • OIL COOLERS

with one tooling setup, requiring only positioning of the workpiece in the dies between each bend. The pipes are produced at an average speed of 540 bends per hour. Gross production averages 135 completed pieces per hour.

Typical results on other tail pipe jobs, requiring multiple bends in automatic sequence are shown at the right.

Name of Part	Material	Multiple Bends Required	Net Production
1938-39 Chrysler, DeSoto, and Dodge tail pipes	1¾ in. OD Steel tubing	6 bends	140 completed pcs. (840 bends per hr)
1951-52 Kaiser tail pipes	2 in. OD Steel tubing	8 bends	95 completed pcs. (760 bends per hr)
1951-52 Buick Special tail pipes	2 in OD Steel tubing	9 bends	83 completed pcs. (747 bends per hr)

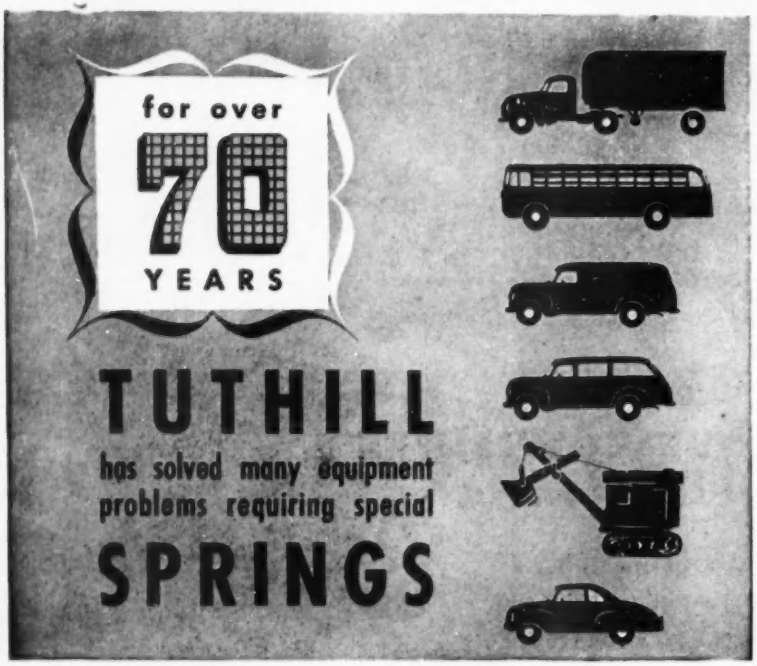
Setup time on two different tail pipe models, each with four bends, was 1½ hours and 2½ hours respectively.

Perhaps the major design feature of the Pines bending press that has made possible this increased output at Maremont is the extra working clearance in front on both sides of the forward-mounted wing dies. This has been accomplished by mounting twin, double-acting, cushion cylinders on each side of the press frame which eliminate normal base obstructions. This extra working clearance permits angle-of-bends to 180 deg in two in. OD tube on a center-line radius of five in. The unit is provided with adequate power for repeat bending of ½ in. through two in. OD steel tubing sizes, and a maximum capacity for handling such tough jobs as two in. steel tubes with an 0.083 in. wall thickness.

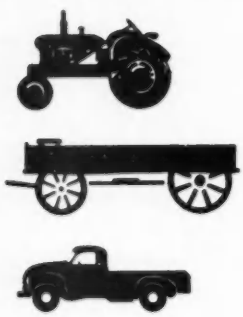
Another feature which further increases production efficiency is a 10-station angle-of-bend selector which controls the angle of bends. Means are provided so that the turret resets automatically to starting position after any number of bends, from one to 10, which eliminates cycling through any unusued stations. The control turret of the selector is designed so that it can be stored with settings for a given job. This saves setup time on repeat jobs and insures accuracy.

Still another result achieved by Maremont with the new equipment is better quality work. The positive, equalizing action of the twin die cushions assures better wing die control and avoids the problem of flat bends and wrinkling often encountered with deep bends. Operating through heavy alloy spindles of the crank arms which are mounted in needle bearings, smoother operation is achieved and the problem of diminishing pressure is eliminated. Cushion pressure is adjustable from ½ ton to 15 tons to suit a wide range of working conditions.

The new press is very compact. Its 100-gallon oil reservoir is built-in, and the 20 hp, 200 rpm motor and a Vickers 200 psi pump are mounted vertically on the back frame which conserves floor space.



Since 1880 Tuthill has specialized in designing springs to fit every specific need. Whether your spring requirements are for trucks, buses, automobiles, power shovels, farm wagons or dual and triple axle heavy-duty jobs—Tuthill can meet them quickly and economically. And now, MOLYBDENUM DISULPHIDE (MoS_2) . . . the newest Tuthill extra that keeps springs from *squeaking* and *galling*, is an added Tuthill feature that distinguishes this famous line.



Whatever your spring requirements may be — see Tuthill first!

TUTHILL SPRING CO.

760 W. POLK ST.,
CHICAGO 7, ILLINOIS

BOOKS . . .

ANALYSIS OF ALUMINUM ALLOYS, *by G. H. Osborn and W. Stross, published by Chemical Publishing Co., Inc., 212 Fifth Ave., New York 10, N. Y. Price, $3.50.* This is a survey of analytical methods many of which are new, others are modified versions of known methods, and a few are established standards. Methods range from those requiring modern physicochemical instruments, such as a polarograph and photometer, to those which may be carried out with the normal equipment available in the general chemical laboratory. Details of procedure have been supplemented, where necessary, by theory.

FOR PRECISION

PLUS PRODUCTION . . .

PRECIS-O-NIZING

OLD mass production methods are not enough to satisfy a market that is demanding both *quality* and *lower prices*.

Only through modern precision-production techniques can a manufacturer hope to use this two-edged sword to his own advantage!

Because of this need for a productive method of generating precision . . . the Microhoning process was evolved. For a quarter of a century the Micromatic Hone Corporation, working with industry, has led the honing field in the development of equipment that would productively finish parts within the ever-shrinking tolerances of new designs and standards.

This applied precision-adeptness of the Microhoning process is "PRECIS-O-NIZING".

In one economical operation Microhoning abrades stock rapidly and efficiently with a minimum of heat to generate—

—bores that are round and straight
—accurate diametric size
—a functional characterized (cross-hatch pattern) surface finish that is free of smeared or distorted material.

The processing of sewing machine parts is an example of PRECIS-O-NIZING.

Sleeves are typical industrial sewing machine parts that are Microhoned. Total tolerance for size, roundness and straightness is held to .0003 inches, or less.

The shaft bushings (needle, presser, eccentric, hook . . .) are specific applications of fractional Microhoning.

The characterized cross-hatch pattern and the precision of Microhoning enable these rotating and reciprocating bushings to retain infinite reservoirs of lubricating oil. At the same time, they maintain zero precise fit with their shafts that a working seal is formed and there is no leakage at all.

Similar parts are interchangeable; selective fitting of components is no longer necessary.

Microhoning equipment is available to handle all kinds and sizes of parts . . . from soft non-ferrous metals to hardened steel and special alloys . . . from .078 to 60 inches in diameter and from ¼ inches to 75 feet in length.

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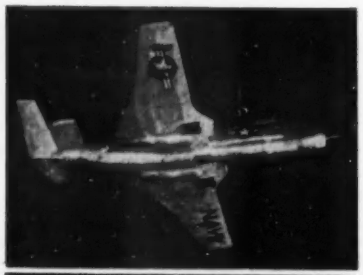
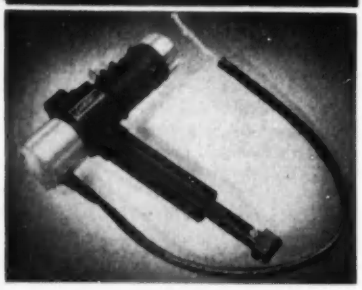
ELEVATOR FEEL TRIM

Airborne Actuated on Navy's F2H-3





The elevator feel trim system in this McDonnell jet is actuated by Airborne's Model R-144M12-1 LINEATOR®. A ball bearing jackscrew enables this actuator to operate at 11 inches per minute with an 800 lb. load in either tension or compression.

The "T" type LINEATOR fits many situations where light weight and short length, for a given stroke, are desirable features.

Perhaps you have a similar application. Our literature in the I.A.S. Aeronautical Engineering Catalog gives detailed data on LINEATOR and other actuators manufactured by AIRBORNE.

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SHORTIES

A medium-sized tank requires: 1915 lb of chromium; 950 lb of manganese; 520 lb of nickel; 100 lb of tin; 6512 lb of bauxite; and 1418 lb of copper.

•

De-icing equipment in the tail assembly of a giant U. S. transport plane produces enough heat to warm a dozen six-room homes.

•

A typical World War II bomber carried an 11-man crew and contained 10 miles of electric wiring. A new jet bomber carries a three-man crew and has 27 miles of wiring, exclusive of wiring in automatic equipment.

•

The flight of the first Wright plane, in 1903, covered a distance only about one-half of the wingspan of a modern heavy bomber.

•

The U. S. Census Bureau estimates that 193 million Americans will be operating 65 million automobiles in 1975—one-third more than in 1952.

•

Since 1949, school buses have regularly totaled 70 per cent or more of U. S. bus output.

•

A battery built at this time to meet today's automotive requirements, if constructed within the limits of technical knowledge existing in 1913, would be five times as large, five times as heavy, and would cost four times as much.

•

U. S. manufacturers have produced more single- and multi-engined jet planes—and more research aircraft—than the rest of the world combined, with the exception of Soviet Russia.

What do you know about the *Moly-sulfide* LUBRICANT?

A LITTLE DOES A LOT

You may have heard about a highly successful solid-film lubricant which is giving remarkable results in the shop and in the field.

In one 40-page booklet we have collected 154 detailed case-histories describing how difficult lubrication problems have been overcome by molybdenum sulfide. If you wish to be up to date about this solid-film lubricant, write for a free copy now.

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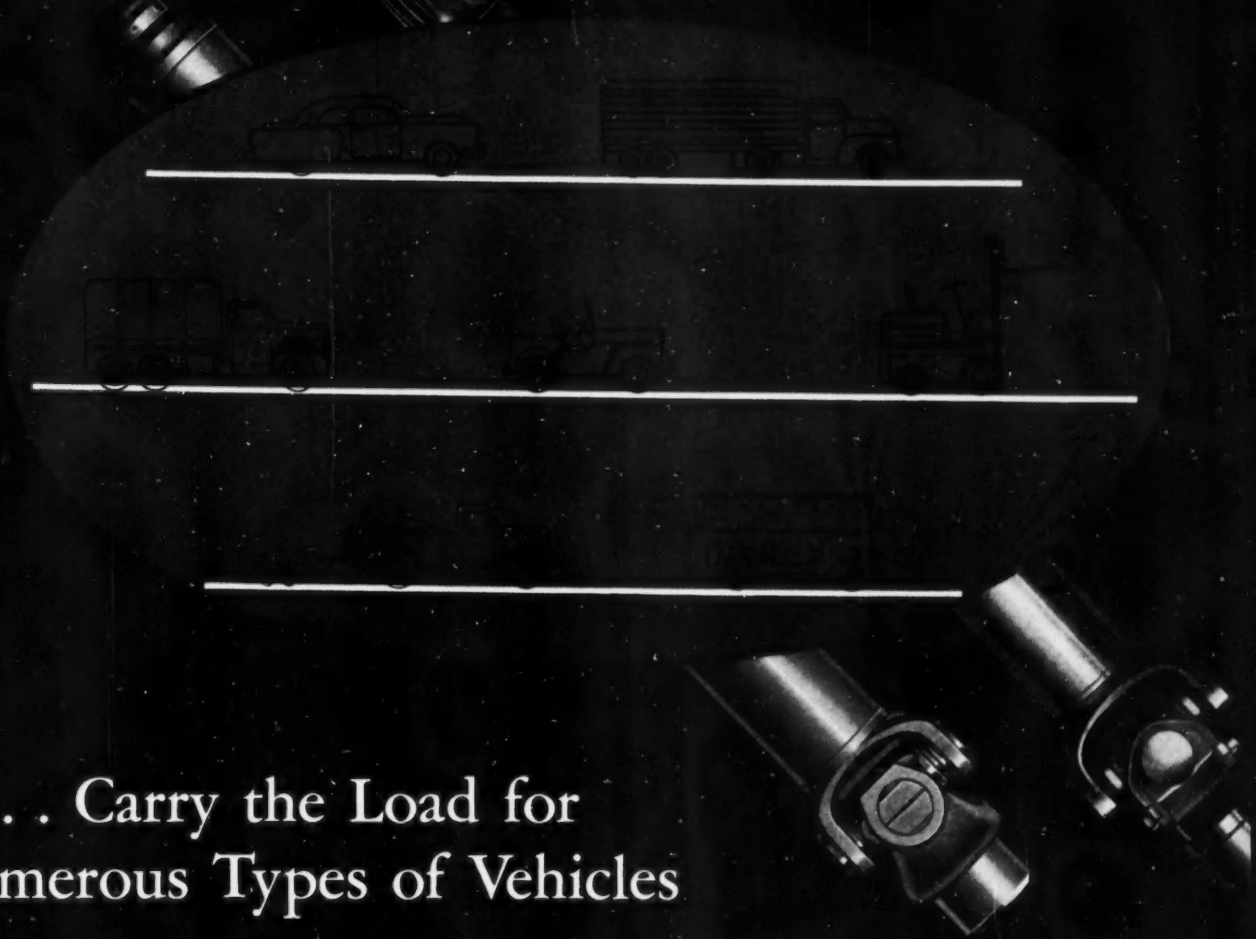

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UNIVERSAL PRODUCTS COMPANY, Inc., Dearborn, Michigan

CALENDAR

OF COMING SHOWS AND MEETINGS

Third Annual European Machine Tool Exposition, Brussels, Belgium .....Sept. 4-13

National Aircraft Show and 50th Anniversary of Powered Flight, Vandalia Airport, Dayton, O..Sept. 5-7

Society of British Aircraft Constructors' Display, Farnborough .....Sept. 7-13

SAE National Tractor Meeting and Production Forum, Hotel Schroeder, Milwaukee, Wis. Sept. 14-17

National Petroleum Institute, annual meeting, Atlantic City, N. J. Sept. 16-18

Truck Body & Equipment Ass'n annual meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio....Sept. 21-23

Eighth National Instrument Conference and Exhibit, Chicago, Ill. .....Sept. 21-25

Second National Electrical Industries Show, 69th Regiment Armory, New York, N. Y. Sept. 29-Oct. 2

SAE National Aeronautic Meeting, Hotel Statler, Los Angeles, Calif. Sept. 29-Oct. 3

American Inst. of Electrical Engineers Aircraft Technical Conference, Benj. Franklin Hotel, Seattle, Wash. .....Sept. 30-Oct. 2

Paris Salon, France .....Oct. 1-11

Eighth Midwest Quality Control Conference, Masonic Temple, Davenport, Ia. .....Oct. 8-9

First International Engineers' Conference, Rome, Italy .....Oct. 8-11

Automobile Old Timers' 14th Annual Meeting, Hotel Astor, New York, N. Y. .....Oct. 14

35th National Metal Congress and Exposition, Cleveland, O. ..Oct. 17-23

41st National Safety Congress and Exposition, Chicago, Ill.....Oct. 19-23

38th International Motor Show, Earls Court, London .....Oct. 21-31

American Gear Manufacturers Association Semi-Annual Meeting, Edgewater Beach Hotel, Chicago, Ill. .....Oct. 25-28

Manufacturing Conference, American Management Association, Bellevue-Stratford Hotel, Philadelphia, Pa. .....Oct. 28-30

SAE International Production Meeting, Royal York Hotel, Toronto, Canada. .....Oct. 29-30

American Society of Tool Engineers, semi-annual membership and board meeting, Dayton Biltmore Hotel, Dayton, O. .....Oct. 30-31

SAE National Transportation Meeting, Conrad Hilton Hotel, Chicago, Ill. .....Nov. 2-4

SAE National Diesel Engine Meeting, Conrad Hilton Hotel, Chicago, Ill. .....Nov. 3-4

Third Transport Aircraft Hydraulic Conference, Park Shelton, Detroit, Mich. .....Nov. 3-4

SAE National Fuels and Lubricants Meeting, Conrad Hilton Hotel Chicago, Ill. .....Nov. 4-6

17th Annual Time and Motion Study and Management Clinic, Industrial Management Society, Sheraton Hotel, Chicago, Ill..Nov. 4-6

Refrigeration and Air Conditioning Exposition, Public Auditorium, Cleveland, O. .....Nov. 9-12

American Petroleum Institute Meeting, Hilton Hotel, Chicago, Ill. Nov. 9-12

Montreal Materials Handling, Tool and Industrial Equipment Shows, Show Mart, Montreal, Que. .....Nov. 9-13

Association of American Battery Manufacturers, Fall Meeting, Edgewater Beach Hotel, Chicago, Ill. .....Nov. 16-18

Fourth Pan American Road Race, Mexico .....Nov. 19-23

American Society of Mechanical Engineers, annual meeting, Statler Hotel, New York, N. Y. Nov. 29-Dec. 4

1954

SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich. .....Jan. 11-15

National Motor Boat Show, Bronx, N. Y. .....Jan. 15-23

National Transport Vehicle Show and Fleet Maintenance Exposition, New York, N. Y.....Feb. 17-19

SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....March 2-4

Manufacturers of...

HARDENED and GROUND PARTS

for over 40 years

SINCE the day of the duster and goggles, The Brown Corp. has meant highest quality precision parts for the automotive industry. Today, Brown Parts serve trucks, tractors, trailers, buses, axle builders, off-the-road machines and Diesel locomotives. The production methods and facilities we have developed are unexcelled — uniform product quality is assured—deliveries are reliable—service is efficient. Ask any of our long list of satisfied customers throughout the industry.

For further information about our specialized production of hardened and ground automotive and industrial parts, just drop us a note. We invite an opportunity to quote on your work.

Henry W. Brown

PRESIDENT

KING PIN

Parts include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.

213 BELLEVUE AVE. SYRACUSE, N. Y.

C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 5609 N. Clark St., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Johns William & Co., 1440 N. Spring St., Los Angeles, Calif. • John B. Hunt, 5611 S.E. Yamhill St., Portland, Ore.

Do you need the solution to a tough, high-production metal-working problem?

If you do, Kearney & Trecker's Special Machinery Division has the "know-how" and capacity to design and build the special equipment you need

SINCE 1898 Kearney & Trecker has been aiding the metalworking industries by overcoming production difficulties with special machines and tooling or adaptations of standard equipment.

Today, its Special Machinery Division is in a better position than ever before to help you with your problems. It has a new $5,000,000 plant to work in . . . and over $2,500,000 worth of new tools to work with. The Special Machinery Division is staffed by almost 100 design, project and production engineers plus a full complement of skilled machinists and floor men.

Take the first step now

Get in touch with your Kearney & Trecker representative or contact the factory. In response, one of our Senior Project Engineers will promptly visit you and make a field analysis of your requirements. There's no obligation, of course.

Our Customer Engineering Service takes over your production headaches

After all the facts have been gathered, a team of Project Men in our Customer Engineering Service will review the job. These widely-experienced, practical-minded men will check the work-piece itself . . . how to hold, machine and process it . . . and every other contributing factor. They'll develop preliminary sketches and get started on a proposal.

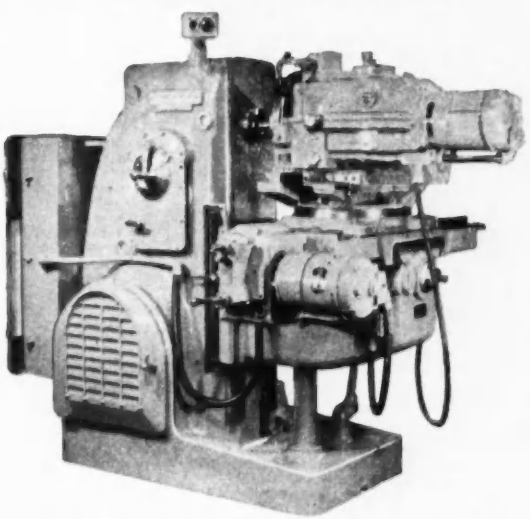
You get quality equipment, delivered when promised, carefully installed

As the Special Machinery Division is an integral part of the Kearney & Trecker Corporation, every product is fully supported by the entire organization's financial, physical and personnel resources. This means that, in addition to the machine or machines of exceptional quality that will solve your difficulties, you get delivery as promised plus fully supervised installation and followup service.

We invite your inquiry

We'll be glad to provide you with any information we can. This includes sample machine specification sheets on typical special machine installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service.

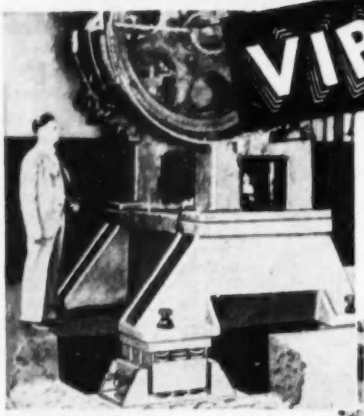
Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 West National Ave., Milwaukee 14, Wisconsin.

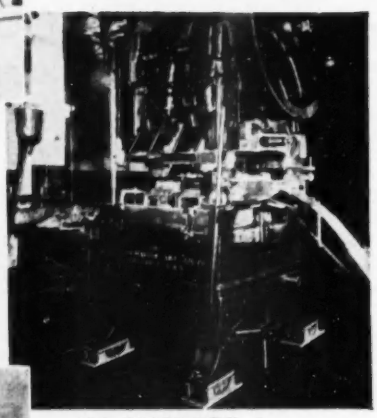


It is not always necessary to design a completely new machine. Here's an example where a standard milling machine column has been fitted with a specially designed fixture. Its job — to produce face, plate and barrel cams of differing sizes.

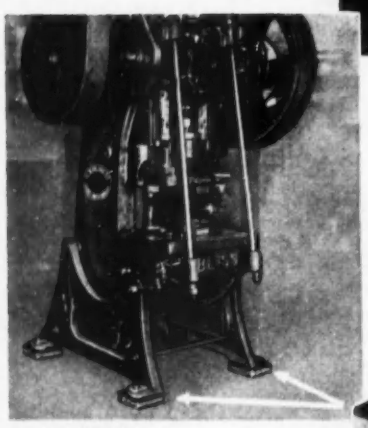
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

STOP VIBRATION with KORFUND VIBRATION CONTROL

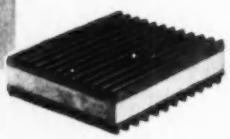




A TOUGH PROBLEM solved by specially designed Korfund Steel Spring Vibro-Isolators. Shock from this 100,000# 600 ton capacity press was cracking building walls. Four specially designed 25,000# capacity Korfund Steel Spring Vibro-Isolators, themselves weighing 600# each, were installed under the press. Building damage stopped and heavy production schedules were maintained. Yet, the price of the special Korfund Isolators was less than 3% of the press cost.



AN AVERAGE PROBLEM—typical of those solved every day by Standard Korfund Steel Spring Vibro-Isolators. Vibration and noise from this double crank press, which could be felt and heard throughout the building, were stopped by Standard Korfund Steel Spring Vibro-Isolators. More and more manufacturers are discovering how Korfund Vibro-Isolators permit press installation without reinforcement of floors, permit press installation *anywhere* (even near precision equipment) for better plant layout, increase press speed and production, improve quality.



A SIMPLE PROBLEM solved inexpensively and effectively by Korfund Elasto-Rib Pads. In this case, Elasto-Rib Pads installed under each of the legs of this press stopped transmission of vibration and noise. For the less critical installation, Korfund Elasto-Rib Pads provide low-cost, effective vibration and noise control, and eliminate bolting to the floor.

PUNCH PRESSES are notorious for the amount of vibration and noise they transmit—yet in the three cases illustrated, Korfund Vibration Control units successfully solved the problem. In our files are scores of case histories describing equally satisfactory installations on many other types of machinery.

A selector chart is available giving recommendations for various vibration control problems. Write for your copy of Bulletin No. 13, or see our catalog in Sweet's Files.

For specific recommendations, contact us or the Korfund representative you'll find in most principal cities. A half-century of experience is at your disposal.

THE KORFUND CO., INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

48-02A Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

Industry News

(*Continued from page* 98)

1000 R-1300 by Willys

Willys Motors, Inc., has delivered to the Air Force its 1000th Wright Cyclone R-1300 aircraft engine, in nine months of operation at the Detroit Engine Div. In November, 1952, the division qualified as a licensee manufacturer. The transition from assembler to manufacturer was completed after production of 277 units in addition to the 1000 completed under the contract.

New Parts Depots

Three new Ford Div. parts depots will be completed and put into operation during the next few months to serve 1100 dealerships in the East and Midwest. The plants are located at Teterboro, N. J., Pittsburgh and at Chicago, making 17 such new facilities built since World War II. They will total about 675,000 sq ft of floor space.

New Mechanical Rubber Unit

Haartz, Mason, Inc., of Watertown, Mass., manufacturers of coated fabrics, announces the formation of a new Mechanical Products Div. which will manufacture precision molded diaphragms and rubber coated fabrics for a variety of industrial applications. Primary product development efforts will be for the automobile, aviation, gas and petroleum industries.

Nickel Process Sold

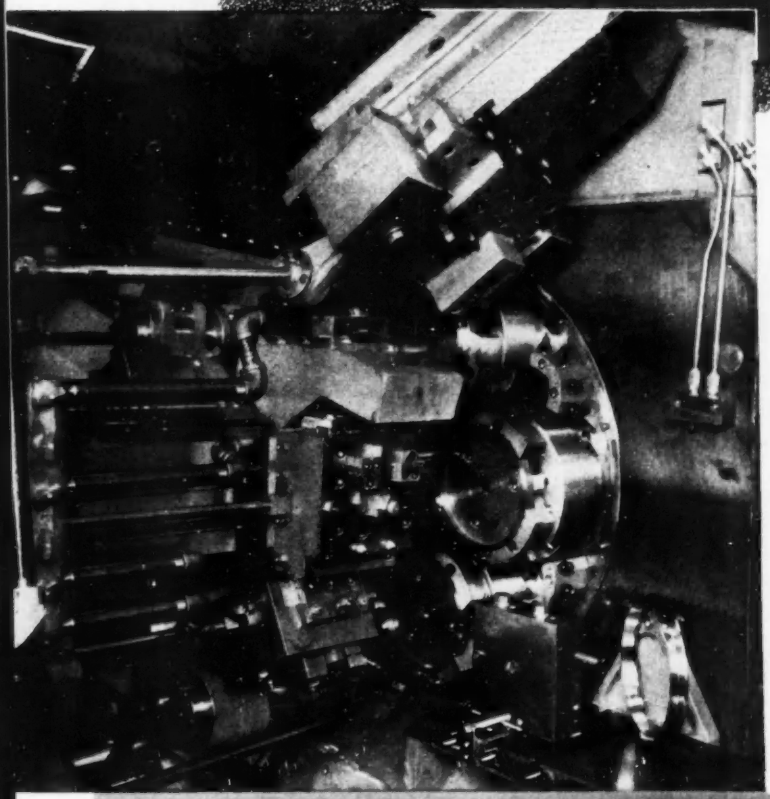
Smoothex, Inc., Cleveland, O., announces the sale of their bright nickel process to the Udylite Research Corp. of Detroit. Sparkling nickel brightness instantly occurs at the beginning of the plating cycle with lustre increasing in intensity until maximum specular brilliance is reached. There is no dull period.

When using this process, flaws in the material or lines left by the polishing wheel disappear. The process can be operated at current densities from 5 to 100 amperes per square foot maintaining a fine grain structure of the electro deposit. It is adaptable for use on buffed brass, steel and copper, unpolished cold-rolled steel, fine finished steel, dull steel and die castings after conventional copper cyanide plating.

Smoothex, Inc., will continue its development work on other processes directing the bulk of their efforts to their new bright copper program.

(*Turn to page* 136, *please*)

ACME-GRIDLEY CHUCKERS take the TOUGH JOBS



This 8″ Combustion Chamber Flange for jet engines is no job to be fooled with.

Machined from 8″ diameter stainless steel blanks as shown, it presented first the problem of removing a lot of metal FAST—321 stainless is a difficult metal for precision results.

Tooling for accuracy and finish included both roughing and finish taper turning and boring attachments for the special angles and for holding the thin wall within .008 without danger of collapsing the piece.

All 13 operations were performed on the 10″ Acme-Gridley Model RPA 6-spindle fully automatic Chucking Machine with carbide tipped tools at a net output rate *more than 6 times faster* than was possible on the turret lathe method formerly used.

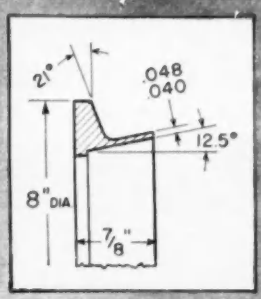
Performances like this have demonstrated to the owners of more than 45,000 Acme-Gridley bar and chucking automatics that design rigidity and tooling ingenuity are your best insurance for sound production and profitable end results.

Acme-Gridley Chucking Automatics are built in 4, 6 and 8-spindle models with capacities ranging from 5¼ to 12″.

★ **Ask for guaranteed figures on your work—Tough jobs or otherwise.**

JOB FACTS:

PART—Jet Combustion Chamber
SIZE—8″ Diam., ⅞″ long
MATERIAL—Type 321 Stainless Steel
OPERATIONS—13, all with Carbide Tools
MACHINE TIME—1 minute, 16 seconds



The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.

Fully Automatic Transmission For Fork-Lift Industrial Truck

(*Continued from page 63*)

reversed rotation is then transmitted through the selector gear, which is splined to the same shaft, to the pinion shaft which transmits the reversed motion to the ring shaft on the drive axle—and the truck moves in reverse.

During this interval, the primary forward gear is also in rotation. However, the primary and secondary forward gears are not engaged, so the motion of the primary forward gear is independent of, and in the opposite direction to, the motion of the secondary forward gear.

Both the torque converter and the forward - reverse transmission are served by one hydraulic system activated by a gear-driven pump. The latter has a capacity of 1.7 gal/1000 rpm, and is geared to the impeller. The pump is connected to the input rather than the output side of the torque converter because the output side would not rotate during a period of stall. A standard Type A automatic transmission fluid is used with the Hydratork Drive. The fluid reservoir is the transmission case, which holds approximately four gal.

During the regular operation of a Hydratork-equipped fork-lift truck, the hydraulic pump circulates fluid at 80-90 psi pressure to the direction selector valve. This is a slide type valve actuated by the direction selector lever on the steering column. Movement of the lever exposes one of two ports which lead to the drum-shaped secondary forward and reverse gears.

In the secondary forward and reverse gears, a constant bleed hole behind the pistons returns hydraulic fluid to the circulation system.

A pressure regulating valve on the hydraulic system keeps the fluid pressure at 80-90 psi. A pressure control valve on the torque converter inlet keeps the pressure in the torque converter at 60 psi; and a pressure relief valve on the torque converter return line acts to hold a minimum safe pressure in case of pressure failure in the system at some other point.

Hydraulic fluid leaving the secondary forward and reverse gears and the torque converter is pumped to a conventional radiator-and-fan cooler. From the cooler, the hydraulic fluid is circulated through the secondary and primary disks that are not engaged, to carry away any heat built up in the previous engagement.

As mentioned earlier, a Hydratork-equipped fork-lift truck has three controls: an accelerator, a brake pedal, and the forward-reverse selector lever. As a safety measure, the selector lever is connected with an electric switch that prevents engine starting unless the lever is in neutral.

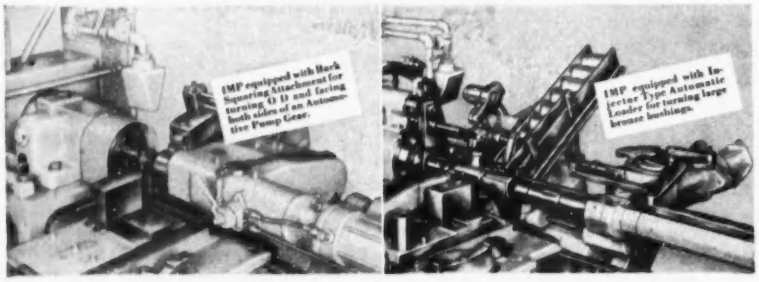
"Inching" is accomplished by partially depressing and releasing the brake pedal. When the pedal is depressed, hydraulic fluid is forced through a bleeder line to a slide-type shut-off valve located above the selector valve. The shut-off valve covers the port leading to the selector valve and uncovers the port to the by-pass line. Flow of hydraulic fluid from the pump to the forward or reverse gears is thereby cut off. Pressure is removed from the engaging disks and the primary and secondary directional gears are disengaged, thereby

(*Turn to page 124, please*)

MACHINE OF THE MONTH

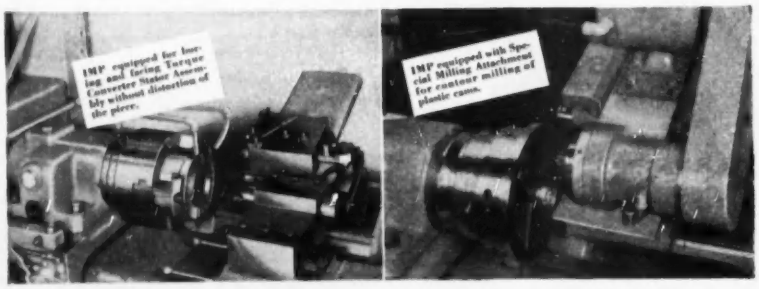
PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

Lo-swing IMP FOR HIGH SPEEDS AND EXTREME ACCURACY


IMP equipped with Hack Sequencing Attachment for turning (1) ID and facing both sides of an Automotive Pump Gear.
IMP equipped with Inverter Type Automatic Loader for turning large bronze bushings.

The Lo-swing IMP AUTOMATIC LATHE lends itself to practically unlimited tooling possibilities. The close-up views above and below show typical applications of standard and special attachments to the base machine which have resulted in increased production and lower costs.

If you have a production turning job requiring high speeds, fine finishes and extreme accuracy, write for IMP Bulletin No. N-50. Seneca Falls engineers will be glad to assist you with any of your turning problems.


IMP equipped for boring and facing Torque Converter Stator Assembly without distortion of the piece.
IMP equipped with Special Milling Attachment for contour milling of plastic cams.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

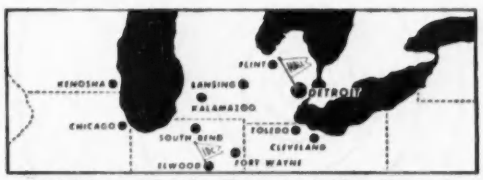
PRODUCTION COSTS ARE LOWER WITH Lo-swing

A Night "Hold-Up"

Suddenly, out of the black, a masked "desperado" appears, thoroughly engrossed in his escapade...completely unmindful of the wheeled danger that rolls toward him. But a sure, split-second stop is made—thanks to the sharp, twin-beams of the back-up lights that stab through the darkness.

Your back-up lights, first developed by the C. M. HALL LAMP COMPANY, work for you surely and automatically everytime you put your car in reverse gear. They team up with other modern vision-aids to make your motoring safer and easier.

The C. M. HALL LAMP COMPANY also manufactures over 200 other kinds of lighting equipment. Since 1909, they have worked hand-in-hand with America's leading automotive manufacturers making many major contributions to Vision for Transportation.



Bright-spot in the Transportation Center!

C.M. HALL Lamp Company

Vision for Transportation

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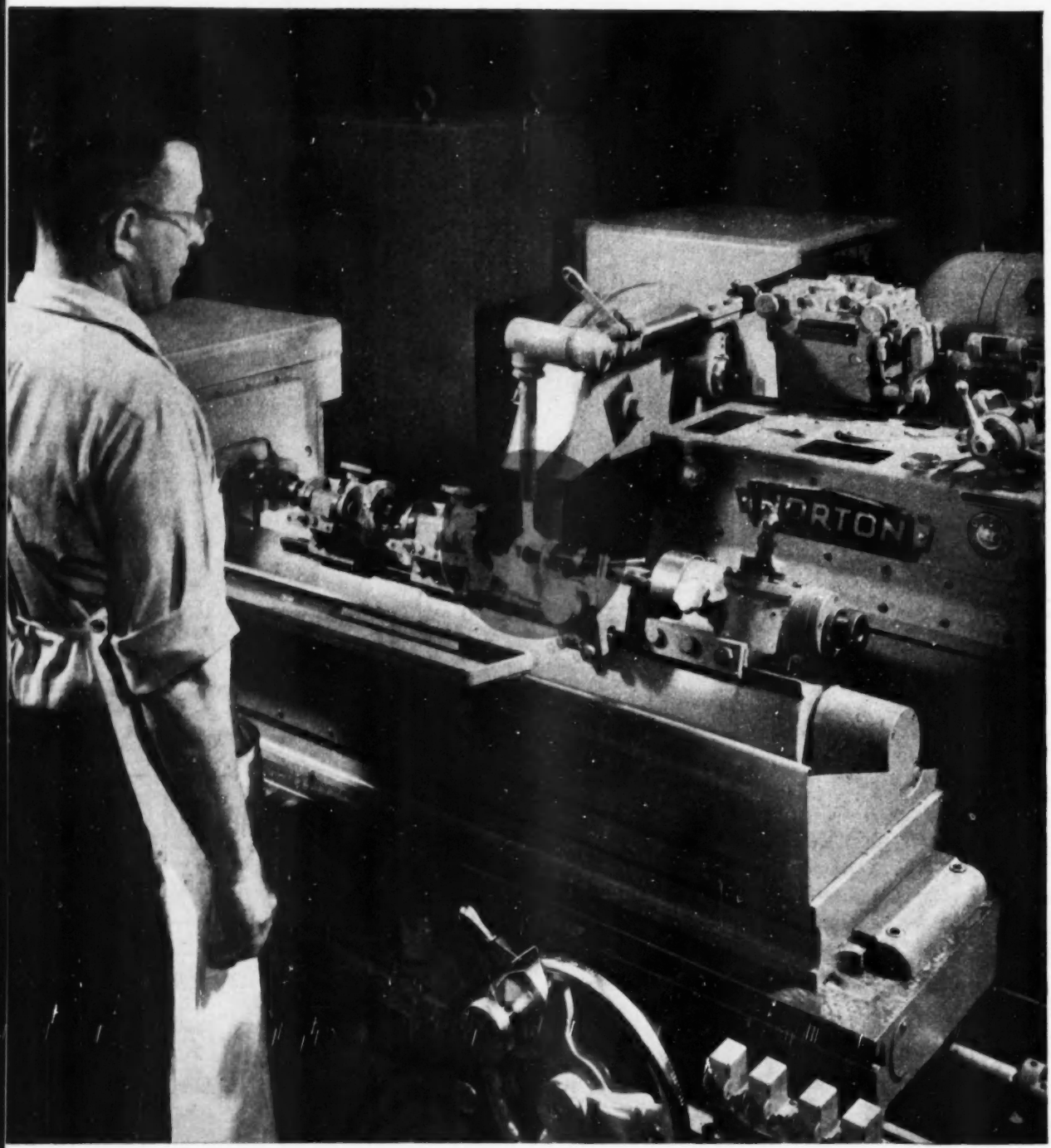
and its wholly-owned subsidiary INDIANA DIE CASTINGS, INC. ELWOOD, INDIANA

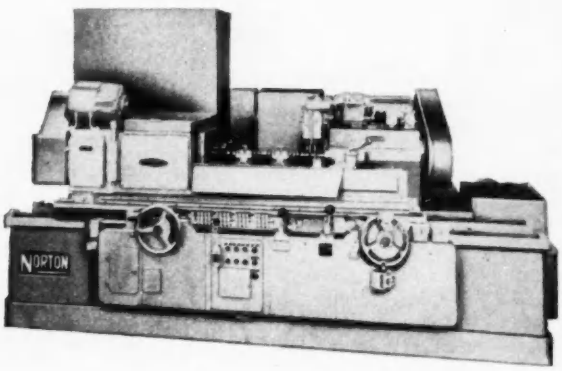
HERE'S HOW YOU CAN ADD THE

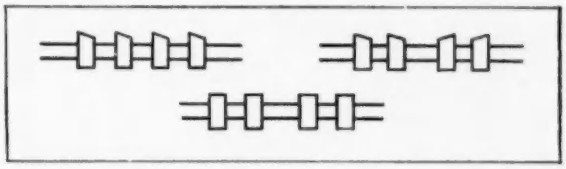


Thanks to the many automatic features of the No. 2 CAM-O-MATIC Grinder, this operator's work is reduced to loading and unloading. He can now tend two or more machines — another big advantage of this Norton-engineered "Touch of Gold."

"TOUCH OF GOLD"

TO YOUR CAMSHAFT GRINDING





The Norton No. 2 CAM-O-MATIC Grinder brings you time-and-money-saving advantages found in no other grinding machine.

In the Norton No. 2 CAM-O-MATIC Grinder you get an ahead-of-the-parade grinding machine that has expert operating skill built right into it. That's your Norton-developed "Touch of Gold" that turns out better camshafts in less time and with less labor . . . adding to product-value and cutting your costs every step of the way.

Speed Is ALWAYS Right — Automatically

One big advantage is the automatically compensating work speed arrangement. Starting with the ideal speed for rapid stock removal, this changes gradually to exactly the right speed for fine finishing and contour accuracy — as each cam is being ground. Eliminating guesswork and manual adjustment, this exclusive Norton improvement steps up both the quality and rate of your production.

Your Choice of Tapers

The swiveling wheel slide — a Norton patent — permits grinding cam tapers in one direction (standard equipment) or tapers in opposite directions on the same shaft (an optional extra). Both arrangements permit straight-face grinding by a simple adjustment. Both grind tapers fast and accurately, while increasing the versatility and capacity of your camshaft operations.

No Lost Motion

The entire operating cycle is geared to split-second efficiency. Indexing is ultra-smooth and extra rapid. Wheel slide retraction after grinding each cam is no greater than maximum stock removal. And the fluid, shockless operation is a sure indication of longer, more profitable service life.

Get All the Facts

on the No. 2 CAM-O-MATIC Grinder from your Norton Representative. Ask him, or write direct, for the 20-page illustrated booklet, No. 195. And remember: only Norton offers you such long experience in both grinding wheels and machines — your assurance of the value-adding, profit-boosting "Touch of Gold." NORTON COMPANY, Worcester 6, Massachusetts.

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THIS IS ALL YOU DO—Just insert collar of Midland Welding Nut in hole for bolt or screw, resistance weld the Nut in place, and the *nut is there for the life of the job.* Nuts can be automatically fed to the welder. No time wasted or trouble screwing-on nuts in hard-to-get-at places. Write for facts about these better connections at *less cost.*

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Manufacturers of

AUTOMOBILE AND TRUCK FRAMES | AIR AND VACUUM POWER BRAKES | AIR AND ELECTRO-PNEUMATIC DOOR CONTROLS

(Continued from page 120)

cutting power transmission to the drive axle. Further depression of the pedal engages the standard hydraulic brakes. Release of the brake pedal releases the hydraulic pressure on the shut-off valve and allows it to return to the open position. The by-pass port is covered and the port to the selector valve is uncovered, permitting hydraulic fluid to flow to the piston in the secondary gears. The piston then acts to engage a set of primary and secondary gears and motion is transmitted to the drive axle.

The brake is equipped with a wide extension pedal to facilitate right or left foot-control.

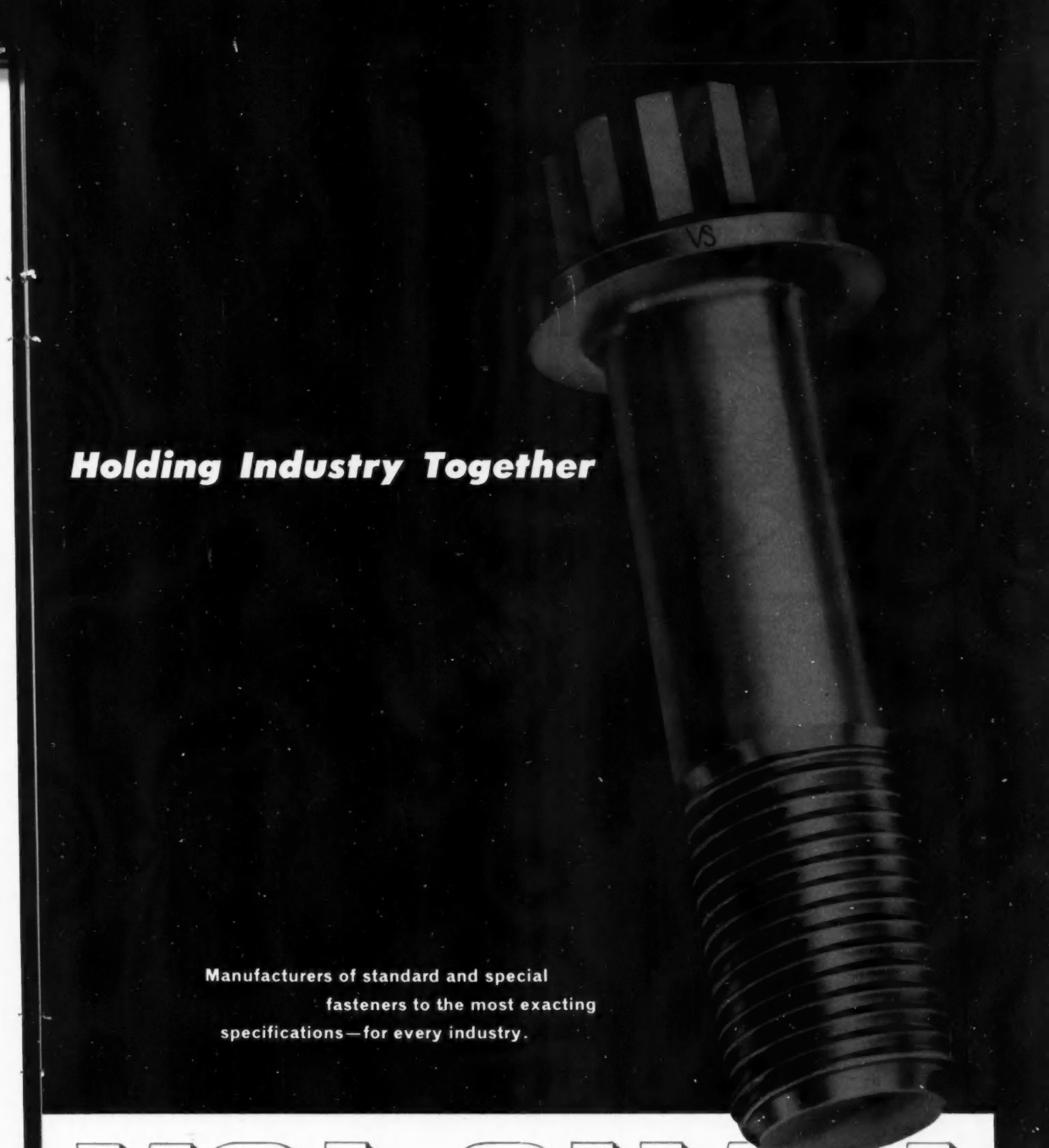
It is said that the transmission housing has been designed to give maximum accessibility for servicing.

BOOKS...

ALUMINUM IN IRON AND STEEL, *by Samuel L. Case and Kent R. Van Horn, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $8.50.* The first part of the book contains a summary of data showing the favorable effect of small amounts of aluminum when added to molten steel as a deoxidizer. The second part presents a correlation of data on the effect of aluminum as an alloying element in steel. The phenomena of inclusion formation, grain size, notch sensitivity, and aging are extensively treated. Material for the book was drawn from over 340 sources.

TEXTBOOK OF THE MATERIALS OF ENGINEERING, *by Herbert F. Moore and Mark B. Moore, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $6.00.* This new publication is a revision and modernization of a leading text in the field. Concise presentation is made of the properties of various materials, used for machine and structural parts, which affect the strength, stiffness, ductility, and resistance to corrosion or wear. The coverage of these properties includes methods of production and chemical and mechanical methods of strengthening materials. The internal structures and processes producing various materials receive brief descriptions. Effectiveness of various treatments for structural or machine parts is demonstrated, along with the limiting stress, strain, or strain energy under which various metals function satisfactorily.

ELEMENTS OF INTERNAL-COMBUSTION ENGINES, *by A. R. Rogowski, published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, $5.50.* Here is a text on internal combustion engines for the engineering student who wishes a knowledge of the factors involved in their safe and efficient operation. Simple application is made of thermodynamic and combustion factors as a basis for calculating engine efficiency. Air capacity is emphasized as the foundation for performance estimation. Simple compressible flow relationships are utilized in carburetor theory. Principles of similitude and more general parameters such as piston speed and area are also used.



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Manufacturers of standard and special fasteners to the most exacting specifications—for every industry.

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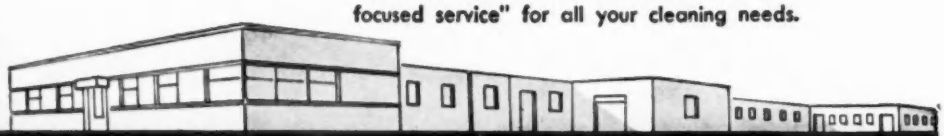
- **PAINT STRIPPERS—specific to your needs.**
- **SUPER-DRAW & FLUID-FILM—for drawing metals.**

Get Northwest's specialized products plus "job-focused service" for all your cleaning needs.

Got a problem? Let our cleaning experts help you!



NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control *serving you since '32*

METALS—

(*Continued from page 94*)

cents per lb delivered in New York prior to July 16, foreign zinc could be offered competitively after paying freight, handling, and tariff of 0.7 cents per lb if it could be bought in London around £73 per long ton. Profits for foreign sellers will be narrower under the new pricing system.

ASARCO also pointed out that zinc was the only important metal where the price varies widely to the consumer depending on the delivery point. The current delivery differentials for copper and lead are small and none exists for aluminum. Even with zinc, the delivered price of Special High Grade has been generally uniform. This has placed producers of Prime Western at a disadvantage and promoted the use of the higher grade metal when Prime Western might have been used to advantage.

New Jersey Zinc Co., a leading producer of Special High Grade, promptly followed ASARCO's action by advancing its price to 12¾ cents per lb, thus maintaining its usual differential over Prime Western. Similar action was taken by U. S. Smelting Co. The Special High Grade metal finds its principal market with the diecasters, whose needs will be affected by any cut-back in the automobile industry.

Lead Price Advances, Then Falters

While it was generally expected that the lead price would advance from 13½ cents, the trade was a little disturbed over two increases of ¼ cent each that followed almost as one. Buying had been excellent until the second advance occurred, then tapered off. Uneasiness over the weakness in the copper market undoubtedly tempered any eagerness to buy lead on an advance.

A firm demand in London for spot lead persisted until the July position was covered, then declined when the squeeze was over. It appears that the strength in the British market was due in part to speculation, for London futures sold consistently about £4 below spot. Nevertheless, it seems certain that lead is getting scarce on the Continent and former excess stocks are nearly liquidated.

Domestic demand for lead continues good. Shipments of replacement batteries are seasonably large, totalling 2,009,000 units in June, compared

To Get More Assembly Production, Use These Production Sockets

A wide range of sizes and styles in seven drive sizes makes it possible to get top efficiency on every application. Use this check list to see how Williams IMPACT "Supersockets"® can help you on all types of assembly and maintenance jobs.

Be Wise . . . Buy WILLIAMS IMPACT "SUPERSOCKETS"®

1. 1/4 INCH SQUARE DRIVE — Single-Hex and Double-Square openings 3/16 to 3/8" in Standard and Bolt Clearance Lengths. Used on a wide variety of sheet metal and small subassembly work. Also available are sockets with carbide inserts for difficult driving problems with hardened self-tapping screws. Accessories include extensions, hexagon-square and magnetic shanks.

2. 3/8 INCH SQUARE DRIVE — Single-Hex, Surface Drive and Double-Square openings 5/16 to 3/4" in Standard and Bolt Clearance Lengths. Sockets in this drive size are also used for sheet metal and small mechanical assemblies of various types and include sizes for Zerk type lubrication fittings. Sockets with carbide inserts, extensions and hexagon-square shanks are also available.

3. 1/2 INCH SQUARE DRIVE — Single-Hex, Surface Drive and Double-Square openings from 3/8 to 1¼" in Standard and Bolt Clearance Lengths. Used for general assembly work including transmissions, differentials, wheel and fender mounting, etc. Surface Drive openings are widely used on multiple nut runners. They allow the driving unit to be freely engaged and disengaged with the work. Sizes and styles for straight and elbow Zerk type lubrication fittings, extensions and hexagon-square shanks are available.

4. 5/8 INCH SQUARE DRIVE — Single-Hex, Surface Drive and Double-Square openings from 1/2 to 1½" in Standard and Bolt Clearance lengths. Used for heavier general assembly work such as running gear components and heavier engine assembly. Surface Drive sockets with openings 5/8 to 1¼" are available for use on heavy multiple nut runners. A variety of extensions and hexagon-square shanks are also available.

5. 3/4 INCH SQUARE DRIVE—Single-Hex and Double-Square openings 1/2 to 1-11/16" in Standard and Bolt Clearance lengths. These sockets are generally used on heavy equipment assembly such as trucks, buses, transports, farm implements and ordnance. They are also widely used in assembling automotive diesel equipment and for general plant maintenance. Extensions, adapters and hexagon-square shanks are available.

6. 1 INCH SQUARE DRIVE — Single-Hex and Double-Square openings 3/4 to 3⅜" in Standard and Bolt Clearance lengths. Used on heavy diesel equipment encountered in truck, bus, ordnance, marine and locomotive assembly. Also widely used for maintenance of heavy factory equipment and structural fabrication. Accessories include extensions for hard-to-reach applications, hexagon-square shanks and adapter for 3/4" drive sockets.

7. 1½ INCH SQUARE DRIVE — Single-Hexagon openings 1-5/16 to 3½" in Standard length. Used extensively on marine, railroad, earth-moving, ordnance and industrial equipment. Also for assembly and maintenance of machine tools, etc. Many of the smaller drive sizes are also used on this type of equipment where the requirements are not as rugged.

Your local industrial distributor will be glad to supply your requirements for Williams IMPACT "Supersockets".® Catalog A-100 will help you in selecting the Williams IMPACT "Supersockets"® that will give you the most production from your IMPACT drivers. Get a copy from your Williams distributor or write direct.

J. H. WILLIAMS & CO.
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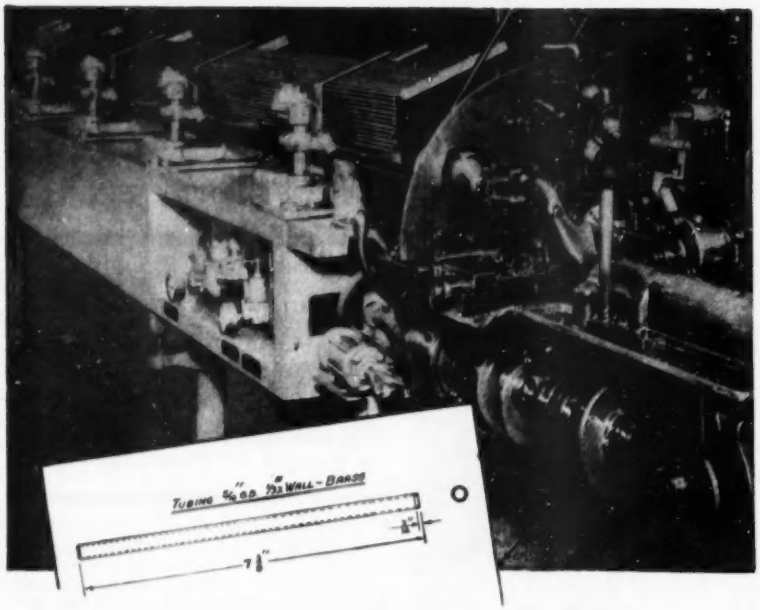


Another Screw Machine Record with

LIPE *Automatic Magazine Loading* BAR FEED

THE JOB—Part shown above made by Trico Products Co., Buffalo, N. Y., on #00G B&S Screw Machine. Length of this part required 7 feed-outs of the feed fingers. Cycle time: 3 secs.—an actual gross of 1200/hr. Best average production with one man handling this and one other machine: 600/hr.

THE IMPROVEMENT—Lipe Automatic Magazine Loading Bar Feed was installed on machine producing part. Cycle time cut to 1¾ secs. Actual gross upped to 2057/hr. A.M.L. Bar Feed, eliminating "cutting air," obtained 94% of actual gross, or 1930 pieces per hour. *A production increase of 221%!* Further savings: Same operator now runs *four* machines, two equipped with A.M.L. Bar Feeds.

THE LESSON—By feeding stock through the collet much faster, Lipe Automatic Bar Feeds increase production on the great majority of screw machine work pieces.

BIG Production Gains on a wide variety of work, BECAUSE—

- Stock is fed to screw machine all the time—not dependent on operator.
- Feed-out pressure always behind stock.
- Eliminates feed fingers.
- Avoids multiple feed finger feed-outs.
- Model AML gives maximum output of machine—no "cutting air."
- Saves in changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers will gladly study your problem—no obligation.

LIPE ROLLWAY — *Lipe* – ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

with 1,535,000 in June a year ago and 1,443,000 in June, 1951.

Imports of lead were heavy in May, the latest month reported, but it is likely they fell off since, as a large amount of Mexican lead has gone to Europe. Imports for the first five months of 1953 have averaged 53,000 tons per month, compared to a monthly average of 51,300 tons in 1952.

Higher Aluminum Price Now Rules

The price advance instituted by the Aluminum Co. of America of 1 cent per lb for ingot and ½ cent for pig was quickly followed by other domestic producers as well as by Aluminium Ltd. of Canada. Producers pointed out that the new price of 21½ cents per lb for ingot was only 1½ cents more than the prevailing price of 1939.

The monthly production of aluminum is about 80,800 tons with still higher output scheduled for later months. This compares with a pre-Korea monthly production of about 57,000 tons. Anticipated lower copper prices and the sharp drop in zinc have lessened the competitive advantage of aluminum in certain fields where the other metals are used. The Government is seeking to enjoin Alcoa from buying 600,000 tons of metal from Aluminium Ltd. over the next six years on the ground that this would impair further competition in the industry.

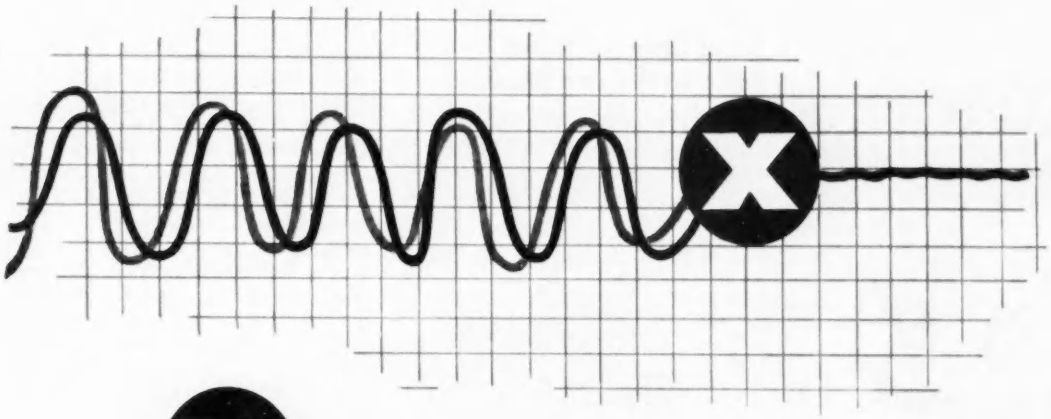
Nickel Controls Likely To Be Eased

The Canadian Defense Production Department has eased some of its controls on nickel, and Canadian buyers of primary nickel are no longer required to obtain approval before ordering the metal. However, the Canadian Government still retains control on foreign shipments.

The International Materials Conference has recommended that international rationing of nickel be dropped after the present quarter.

Reports are circulated that DMPA will release domestic controls over nickel in October because of an improved outlook for supplies in 1954. Heavy pressure has been put on Washington by industrial users to end allocations. It is common knowledge that manufacturers of corrosion-resistant stainless steels for uses other than defense or defense-supporting business have been short of nickel since 1950. The military has had priority upon the limited supplies and its requirements in 1954

To CUSHION SHOCK



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Whether you want to control the accelerating effect of multiple bounces which begin to coincide; or the landing of tons at high velocity; or continuous vibration—this is the realm for our impact-absorbing engineers.

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Size doesn't matter. We can engineer shock absorbing, ton-size or pound-size, stopped to *precise industrial tolerances.*

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Combining the screw with balls enables Cleveland Pneumatic's patented ball-screw actuator to drive with as little as 10% friction . . . compared to as much as 50% for ordinary screw drives. You can cut the weight of a drive system, reduce its space, lessen its cumbersomeness, increase its control accuracy and provide metal-to-metal positioning. Work out your ideas with our engineers.

WORLD'S LARGEST MANUFACTURER OF AIRCRAFT LANDING GEARS

are estimated officially at over 63,000 tons, or about 63 per cent of all nickel available to this country in 1952.

But an improved supply is foreseen from new nickel projects in Canada, in Oregon, and in Cuba that have received Government subsidies and price guarantees. Production from these new facilities will come in slowly but an appreciable increase is expected next year.

Nevertheless, there is a possibility that complete removal of controls on nickel would result in price increase from the present 60 cents per lb, just as happened when copper controls were lifted. A price of 80 cents per lb, such as guaranteed to some of the new projects, would not be surprising. Much of the new nickel production will come from low grade ore that may need a better price than 60 cents to be profitable.

Steel Demand Good But Cautionary Signals Are Up

Steel demand tapered off slightly in August from the hot pace set in the first half of the year but the big mills still reported excellent business with deliveries as much as three weeks behind. Any slackening has been felt principally by the small premium price producers, by the converters, and by the importers, most of whom are gunning actively for fourth quarter business.

A cautious feeling is plainly shown by purchasing agents who don't want to contract for steel past October. Steel output continues to roll along at an annual rate of 113 million tons, or about 96 per cent capacity, but this is in contrast to over 100 per cent during the last six months and shows that extreme pressure is off the market.

It is also significant that many defense contractors are no longer asking the ODM for priority aid in buying their steel. The agency has announced that direct defense producers will use 20 per cent less steel in the fourth quarter but this doesn't mean that defense production will be reduced. It indicates rather that steel supply has been sufficiently improved so that buyers can go direct to the mills and by-pass Government controls and regulations. The ODM allotment for the fourth quarter amounts to 1.8 million tons of steel compared with a third quarter ration of 2.2 million tons.

Cancellations have been few at the steel mills. This isn't to say that they couldn't occur in the fourth quarter order books which will carry a considerable carry-over tonnage. Once started, cancellations can snowball rapidly as a result of even moderate cutbacks in manufacturing schedules of important customers. Inventories considered insufficient when business is rushing can look too large with a change in business tempo.

A note of caution was sounded by the chairman of U. S. Steel that was somewhat in contrast to more optimistic leaders in the industry. He said his company expected to operate at less than full capacity in the fourth quarter. The anticipated decline in operations, he added, will occur in some products earlier than others and at varying times in different parts of the country.

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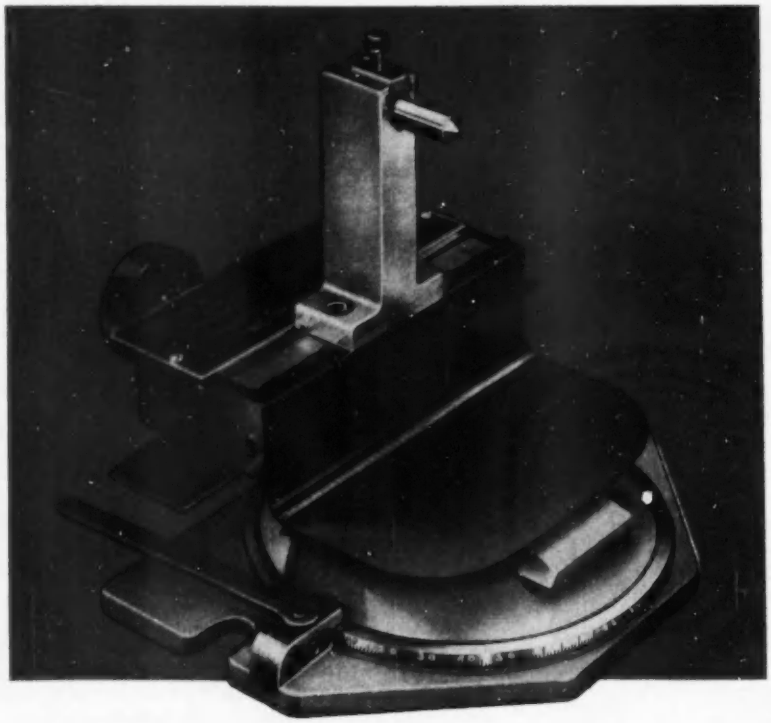

Dress formed grinding wheels to a .0001" accuracy with the

B-1 Angle tangent to radius DRESSER

This easily operated formed wheel dresser is of sturdy construction and has exceptional built-in accuracy. Simple or complex forms can be dressed on grinding wheels to an accuracy of .0001". Years of use in thousands of plants have proved the worth of the Vinco Model B-1 dresser on production work as well as tool room and gage grinding operations.

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OBSERVATIONS

(*Continued from page* 96)

vately printed from a copy of the original book purchased in England in 1915. Not designed for sale, the book has been mailed to a selected group of individuals and organizations for use as a reference. We understand that the book has been in demand but hard to get because it has been out of print for so many years. Even today the methods employed by the author have a curiously modern note, despite its use of equipment long out of date and the testing of cars now just a memory.

Light Metals

Aluminum and magnesium are providing serious competition for other engineering materials, particularly on heavy-duty vehicles where each pound saving in dead weight means a pound of additional payload. One manufacturer will introduce soon an aluminum landing gear for heavy-duty trailers. It is claimed that some of the parts will be the largest permanent mold castings made to date.

Bust or Boom

Our economy since the beginning of the war years has been so unique and has departed so far from the familiar cycles that professional economists are being driven mad. Fortunately, none of their dire predictions of collapse have materialized. Only recently there was a concerted drive to prove that our economy is on the rocks. Now the experts are saying the boom will continue until the latter half of 1954. Meanwhile the automotive industries are booming with soft spots only here and there and with new car sales reaching for a high. Economists might pay a little more attention to the doings of the automotive industries, the present era of decentralization, the building of new plants for constantly new products. The industry is so vast and represents such a big slice of the national economy that its needs must have a flywheel effect upon business conditions as a whole. Add to that the

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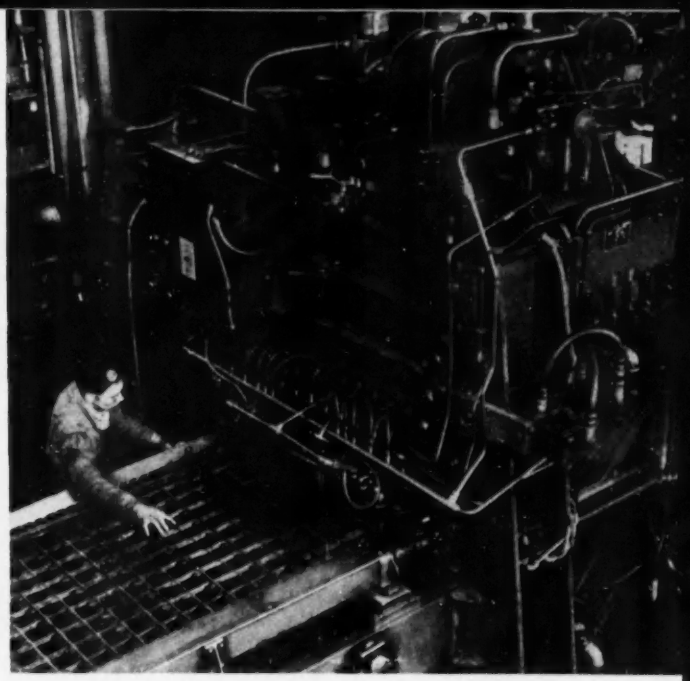
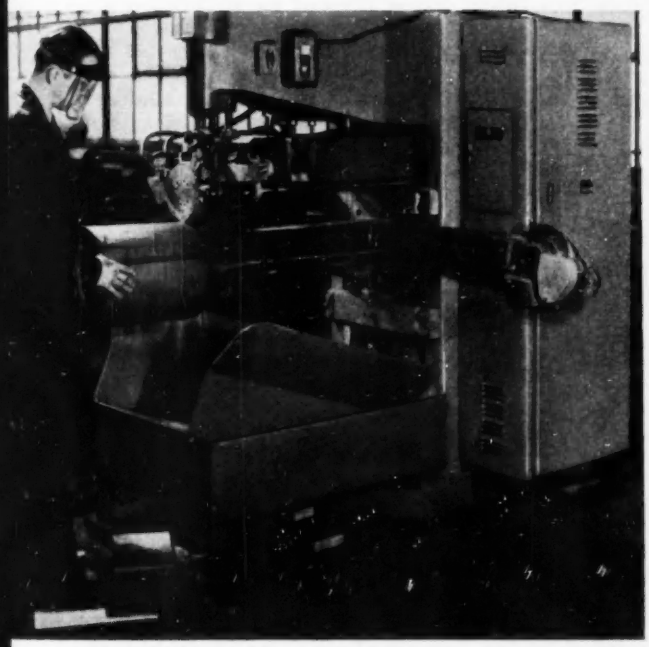


TINY DIODES OR GIANT LANDING MATS . . .

G-E Resistance Welding Controls Cut Rejects, Speed Production



One manufacturer welds delicate germanium diodes so tiny that operators look through magnifying glass to see them (above, left). Another fabricates huge landing mats with a giant multiple-electrode welder (above, right).

BOTH MANUFACTURERS use General Electric controls, as do hundreds of other metal fabricators.

NO MATTER WHAT materials or product you're welding—whether accuracy or speed or a combination of the two is your major requirement—specify G-E control on your resistance welding equipment.

FOR MORE INFORMATION, contact your nearby G-E Apparatus Sales Office or your welding machine manufacturer or his agent, or write:

Section F-785-5, General Electric Company
Schenectady 5, New York

Please send Bulletin GEA-5816, "The Story of Resistance Welding," which gives the how's and why's of resistance welding and a description of G.E.'s complete line of controls.

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COMPLETE LINE of G-E control includes synchronous-precision, nonsynchronous, three-phase, and all special-purpose accessories for all standard spot, seam, combination, or bench welders.

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... double efficiency and LOWER COST 70%

for The Cincinnati Time Recorder Company

The compact, powerful number five Ledex Rotary Solenoid is used to replace the bulky old type solenoid in the Cincinnati series 800, Automatic Time Recorder. By comparison Ledex Rotary Solenoids have 1/7 the weight . . . produce twice the power output with the same electrical input . . . proved to be more dependable and easier to install . . . and reduced the cost of this component 70%. The actual size illustration of the solenoids show the advantage of Ledex compactness . . . 1/6 the volume.

Let Ledex Engineers assist you in choosing rotary solenoids that will save production costs and help increase the efficiency of your products. Six basic models range in diameters from 1⅛" to 3⅜", with torque values from ¼ to 50 pound-inches. Various power linkages and types of mountings are available. Write today for descriptive literature.

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more than 10-million increase in population and you have the setting for good sailing ahead.

Piston Rings

The making of piston rings is an art rather than a science, in the main. Basic design principles and metallurgy lean to scientific accuracy. But the "art" aspect is best exemplified by the comment of a prominent piston ring engineer that "a new piston ring design is born every time someone brings out a new engine." Each new engine seems to have something different about its behavior and each one requires considerable cut-and-try and skillful experimentation before the right ring combination is discovered. In all probability, the problem has been further intensified by the adoption of three-ring setups where one oil ring must do the work previously done by two. To the engine designer this situation emphasizes the important role of independent piston ring manufacturers with a wealth of experience at their command.

MACHINERY INDUSTRIES

(*Continued from page* 80)

awaka, Ind., recently celebrated its 75th anniversary in the manufacture of power transmission machinery.

Gisholt Machine Co. had one of its No. 12 hydraulic automatic lathes on exhibition at the European Machine Tool Exposition in Brussels, Belgium, early this month.

Greenlee Bros. & Co., Rockford, Ill., announced that Harold V. Bailey has been appointed sales manager of the screw machine department, succeeding Ed Kelly who recently retired.

Sundstrand Machine Tool Co., Rockford, Ill, again set an all-time half-year sales record of over $20 million in the six months ended June 30. The sales figure represented a 21 per cent increase over the previous record sales of $17 million in the first six months of 1952. "Backlog of orders at the end of June amounts to $28.3 million as compared to $29.3 million a year ago," said Bruce F. Olson, president, "thus indicating a high rate of activity for the balance of the year."

American Cam Co. has just completed transferral to its new quarters at Bloomfield, Conn. In addition to expanding facilities and employment by approximately 20 per cent, plant layout and work flow will be improved to result in an estimated production increase of 33 per cent.

Announcing a new 3M weatherstrip adhesive

Here's a new 3M adhesive, developed especially to withstand the high-temperature extremes encountered in extensive periods of hot-weather driving.

It's EC-1300—a new, fast-grabbing weatherstrip adhesive that has been rigorously tested *and proved* in the field by leading automotive companies. Results of these tests show that EC-1300 successfully resists interior car temperatures up to 158° F. (This temperature was recorded in one of the cars tested on a desert run.)

What's more, EC-1300 takes hold quicker than any previous 3M weatherstrip adhesive. This means not only faster production but better production, too.

See what adhesives can do for you . . .

If weatherstripping is one of your operations, you'll appreciate EC-1300. It is by far the best weatherstrip adhesive ever made by 3M, supplier of tailored adhesive products for the automotive industry. For more detailed information, contact your 3M salesman, or write to 3M, Dept. 109, 417 Piquette Ave., Detroit 2, Mich.

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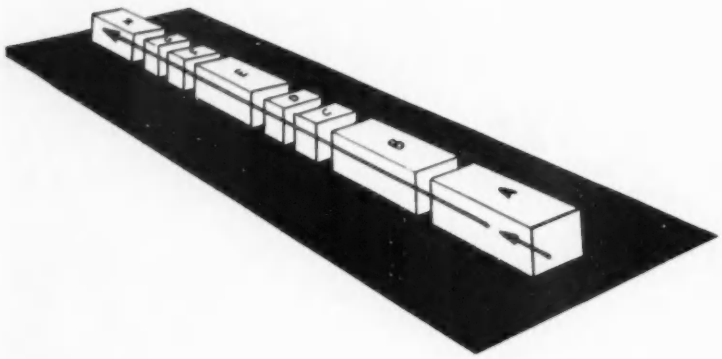
Heat Treat Furnace Layout by Holcroft...3rd of a Series



Ⓐ Carburizing furnace
Ⓑ First hardening furnace
Ⓒ Quench tank and elevator
Ⓓ Wash and dry
Ⓔ Second hardening furnace
Ⓕ Quench tank and elevator
Ⓖ Wash and dry
Ⓗ Draw furnace

Steady Production Flow . . . Different Treating Cycles . . .

Holcroft devised an unusual furnace layout for a manufacturer who had the problem of heat treating a continuous flow of small parts . . . but with different treating cycles.

Four furnaces were placed in line. All production was carburized in the first. Part of the work, then, proceeded through the next three furnaces for refining, hardening and drawing. Another portion by-passes the refining operation and is hardened and drawn. The rest of the production is hardened in the second furnace, drawn at high temperatures in the third, and by-passes the fourth.

This is typical of the economies Holcroft produces for its clients. It's how one manufacturer found that Holcroft furnaces—*individually designed for the specific job*—will produce large volume heat treating at a low-cost-per-heat-treated-piece. Holcroft & Company, 6545 Epworth, Detroit 10, Michigan.

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CANADA — Walker Metal Products, Ltd., Windsor, Ontario
EUROPE — S. O. F. I. M., Paris 8, France

Industry News

(*Continued from page* 118)

Italian Production of Cars Goes Up

Italy boosted her automobile production 23.9 per cent during the first six months of this year, compared with the corresponding period of 1952, and upped her exports by 18.1 per cent. Total production was 81,572 motor vehicles, of which 65,359 were passenger automobiles. All the increase was on private cars and trucks; buses and coaches showing a loss.

Exports totaled 16,597 of all types, representing 22.8 per cent of total passenger car production and 4.9 per cent of truck production. Exports in order of importance were to Germany, Switzerland, Sweden, Austria, Spain, Belgium, Holland and Denmark.

Citroen Purchases Mathis Facility

Citroen has purchased the Mathis automobile works at Strasbourg, France, and will start operations at an early date. The Mathis Co. was declared bankrupt a few months ago, but a skeleton staff of 300 men was kept together on outside contracts. Citroen states that at present it is not known exactly to what use the Strasbourg plant will be put, but in all probability it will be used to increase the output of the main factory located in and around Paris.

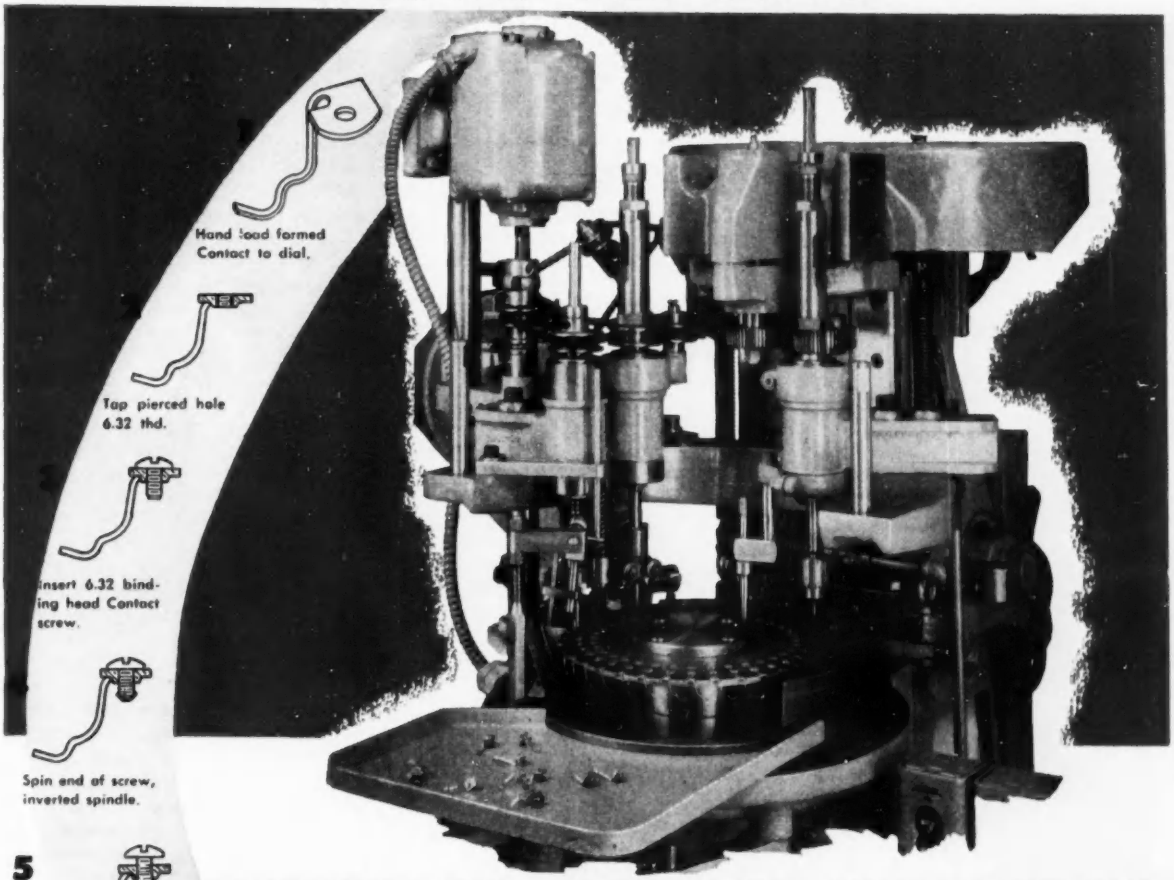
France, Britain Agree

France and England are about to sign an agreement, which will take effect in October, under which each country will allow purchase of automobile products of the other to a value of $560,000 per year. This compares with an allowance of $7,560,000 from Britain to Western Germany and $5,600,000 in the opposite direction.

Last year France exported 2149 passenger cars to England, and the French imported 879 British passenger cars and a few trucks. Most of the French exports were Renault and Citroen knocked down passenger cars which were completed in England and then submitted to the same obligations regarding exportation as British cars. Many of the British vehicles were brought in against dollar and other foreign currencies. No objections are raised against this. It is understood that the existing situation will not be interfered with and that

(*Turn to page* 140, *please*)

Bodine CASE HISTORY NO. 35



* Ejection is accomplished by contact on the backed up screw, thus giving automatic inspection for perfect work.

PRODUCING FLUORESCENT TUBE SOCKET CONTACTS

Bodine No. 40-10 Dial Type Tapping and Screw Inserting machine (all safety guards removed) tooled for production of Fluorescent Tube Contacts. Production rate, 60 pieces per minute.

Bodine multiple spindle automatics lead the field in high speed repetitive production of small parts. If your needs involve drilling, tapping, milling, screw inserting, staking and assembly operations . . . there's a Bodine model we can tool to handle several or all of them on one machine. Ask us for case histories showing what we have done to cut costs of accurate quantity production.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools."

THE Bodine CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

28D53

ON OUR WASHINGTON WIRE

As Congress went home after seven months of the first Republican administration in 21 years, impression of the average observer is that business-industry just about broke even. Congress threw out most of the materials—wage-price controls hand-cuffing business, put a sizable crimp in federal spending plans, took a long step in getting government out of competition with private enterprise. On the other hand, expected tax relief failed to materialize; instead, excess profits taxes were extended for an unexpected six-month period, estimated to cost business about $800 million.

HIGH-EFFICIENCY
SMALL MOTORS
Leece-Neville
LOW VOLTAGE DC
to your specs
Does your product require a d.c. motor in this range: 6 to 32 volts; .002 to .08 h.p. (1½ to 60 watts output); 2,000 to 4,000 r.p.m.? Leece-Neville high-efficiency motors feature precision formed frame; self-aligning, sintered bronze bearings; large reservoir and automatic oil return for reliable lubrication; machine-wound coils. Stack lengths from ⅛" to 1⅛". A producer of small motors in the millions, Leece-Neville will work to your specifications on substantial production runs. The Leece-Neville Co., Cleveland 14, Ohio. Automotive Electric Equipment for Over 43 Years.
YOU CAN RELY ON Leece-Neville
ALTERNATOR SYSTEMS • GENERATORS
STARTING MOTORS • REGULATORS • SWITCHES
TRUCK
BUS
DIESEL
OFF-HIGHWAY
PASSENGER
RAILROAD
MARINE
INDUSTRIAL

Congress refused to cut automotive excises during the session just ended but the tax-writing House Ways and Means committee kept tax hearings going until well into August. Some members of the committee say bluntly that they will flatly oppose any move, by the administration or otherwise, for further extension of present rates. This means that at least there should be a reversion next April to previous rates before the Revenue Act of 1951 of five per cent.

Nearly 18 months will elapse before the government's proposals for sale of its 28 synthetic rubber plants to private industry must be ready for Congress.

A three-member commission is to recommend disposal terms and suitable buyers by Jan. 31, 1955.

A number of members of the Senate and House Labor committees are privately appalled at the extent to which the Administration appears willing to go in revising the Taft-Hartley law. They are determined to block any move to emasculate the existing law.

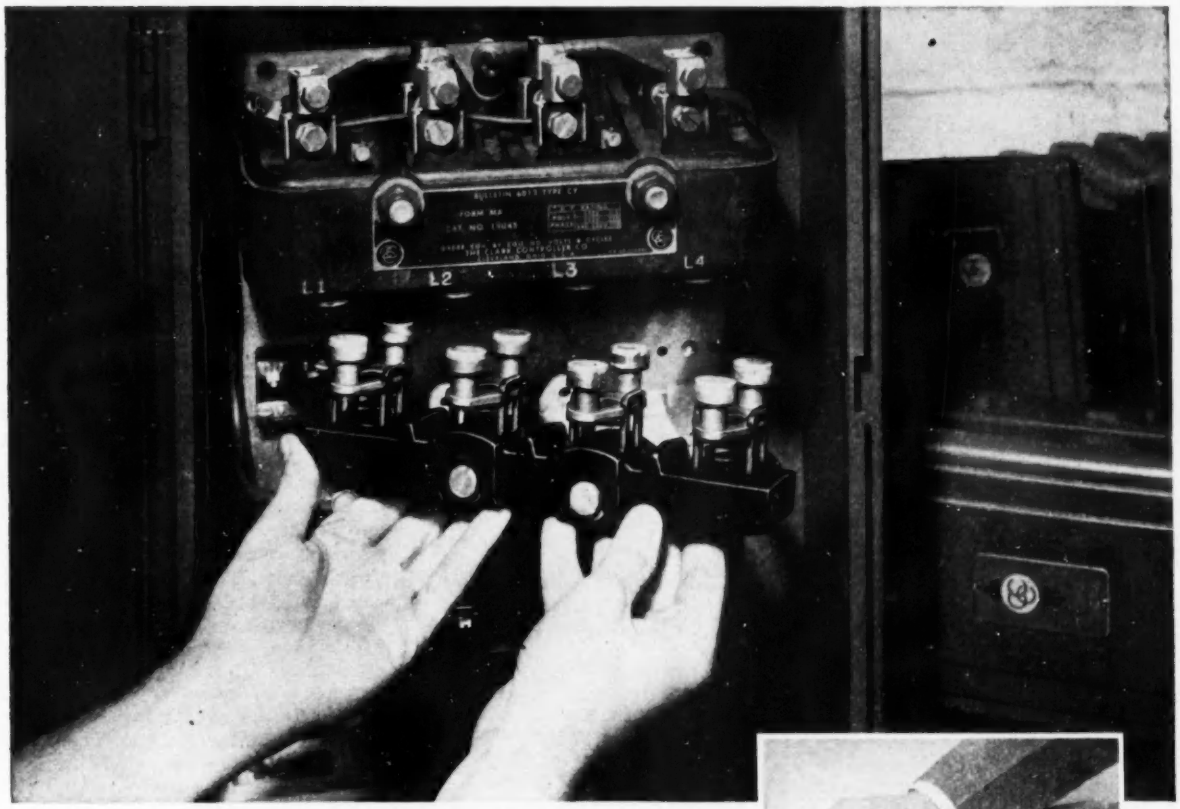
Contractors on atomic energy projects are now fully liable for payment of all applicable state and local taxes.

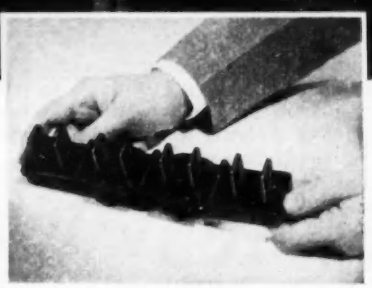
New steam in the drive for adoption of realistic depreciation rates on machinery is building up, and probably will result in definite action by Congress next year. House Ways and Means Committee members also are considering fast write-offs for equipment to reduce air pollution.

Pressure by farmers aided steel truckers as ICC postponed the short-term trip-leasing ban scheduled for Sept. 1.

Another new development using

B. F. Goodrich Chemical *raw materials*





Motor starter unit made by The Clark Controller Company, Cleveland, Ohio. Hycar rubber-phenolic compound supplied by Durez Plastics & Chemicals, Inc., North Tonawanda, New York. B. F. Goodrich Chemical Company supplies the Hycar rubber only.

Add Hycar...Subtract Breakage!

IN testing experimental models of the heavy-duty, 4-pole magnetic motor starter pictured, breakage sometimes occurred with the contact arms.

This was a job where Hycar American rubber could help, as it has on so many similar problems. Hycar was added to the phenolic resin molding compound. It provided the required impact strength and shock resistance. The experimental contact arms worked perfectly—breakage was eliminated. Full-scale production was started.

But Hycar does even more. It also provides high dielectric strength; the molding compound is electrically safe.

Hycar-phenolic compounds are noted for their exceptional shock-resistance—2 to 5 times that of conventional phenolic compounds. They simplify operations, too. In processing, they provide good molding characteristics . . . easy flow in the mold... resistance to cracking around metal inserts in the part.

Hycar is highly versatile. It is used as a modifier for phenolic resins... as a base material... as an adhesive base . . . as a latex for coating or impregnating. Perhaps one of the many Hycar compounds can help you improve or develop more saleable products. We'll help with technical advice. For information, please write Dept. HG-9, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors

no room in your budget for

then you haven't seen

the Tenney SERVO UNIT and COMPANION TEST CHAMBER

Accurate environmental testing, for a wide variety of controlled atmospheric tests, is within the reach of *all* industrial budgets. The cost is well under $2,000 for the majority of industrial needs.

The Tenney Servo Unit, a portable air-conditioning system, provides broad variations of heat, cold, and/or humidity for aging and weathering test programs. Air is circulated at the rate of 40 cu. ft. per min., capable of absorbing 1700 B. T. U. per hour at − 100°F., or of delivering 5000 B. T. U. heating effect at a maximum temperature of + 185°F. Relative humidity can be maintained from ambient to 95% in a temperature range of ambient to + 180°F. in 40 cu. ft. of recirculated air. Low temperature operation requires 10 lb. of dry ice per hour at − 180°F., ¾lb. per hour static.

SPECIFICATIONS

Model	Size	Wgt.	Dry Ice Capacity	Total Temp. Range	Electric Req'mts.
TSU-50	17"x17"x31"	165 lb	50-70 lb.	−100°F. to +200°F.	2 kw.
TSU-150	21"x25"x33"	200 lb.	150 lb.	−100°F. to +200°F.	2 kw.

The Tenney Companion Test Chamber provides an efficient test work-space when attached to the Tenney Servo Unit either horizontally or vertically, by a simple, sturdy device. (Servo is easily detached for use with other enclosures or tests.) Ruggedly constructed and fully insulated, this chamber is built in three sizes of work space, stainless-steel lined: 3 cu. ft. (18" x 18" x 18"), 8 cu. ft. (24" x 24" x 24"), and 27 cu. ft. (36" x 36" x 36"). Forged brass hardware is provided. Complete vapor-proofing is achieved by special gaskets. Optional equipment includes multi-paned viewing window in door, electrical connector panel, turning shafts, coaxial cable, utility ports, and high-voltage terminals.

For further information write:

Tenney ENGINEERING, INC.

Dept. X, 26 Avenue B, Newark 5, N. J.

Los Angeles Representative: GEORGE THORSON & CO.

Engineers and Manufacturers of Automatic Environmental Test Equipment

SEE US AT THE R.E.M.A. SHOW NOV. 9-13 BOOTH 219

#6584

Industry News

(*Continued from page* 136)

the $560,000 exchange will cover transactions in French and British currency. At present these transactions are impossible without an import permit, which is given only in exceptional circumstances.

Renault Profit Down

Although producing 121,462 passenger cars and 50,626 trucks, representing 35 per cent of total French production, as well as 6034 farm tractors or 25 per cent of national production, the profit earned by State-owned Renault for 1952 amounted to only $653,373. This represented 0.42 per cent of the turnover. Contrary to previous years, no bonus was paid to workers and the State received no profits.

Passenger car output showed an increase of nearly 21,000; trucks dropped 16,000 and tractors remained almost stationary. Sales were brisk for the first portion of the year, then slumped sharply, for much of the earlier buying had been of a speculative nature. All the increased output went to the home market, exports remaining stationary. Because of the slump the works had to be run on short time during the latter part of the year but the staff of practically 53,000 workers was kept together.

During the year the new factory at Flins, to the west of Paris, with a covered area of 875,130 sq ft, was put into full production on the 122 cu in. Frigate model. New machine tools installed during the year totaled 22,000, and the average age of the tools was dropped from 15.8 to 15.65 years. With the exception of extensions to the malleable iron foundry, no further increases in factory size are contemplated in the near future.

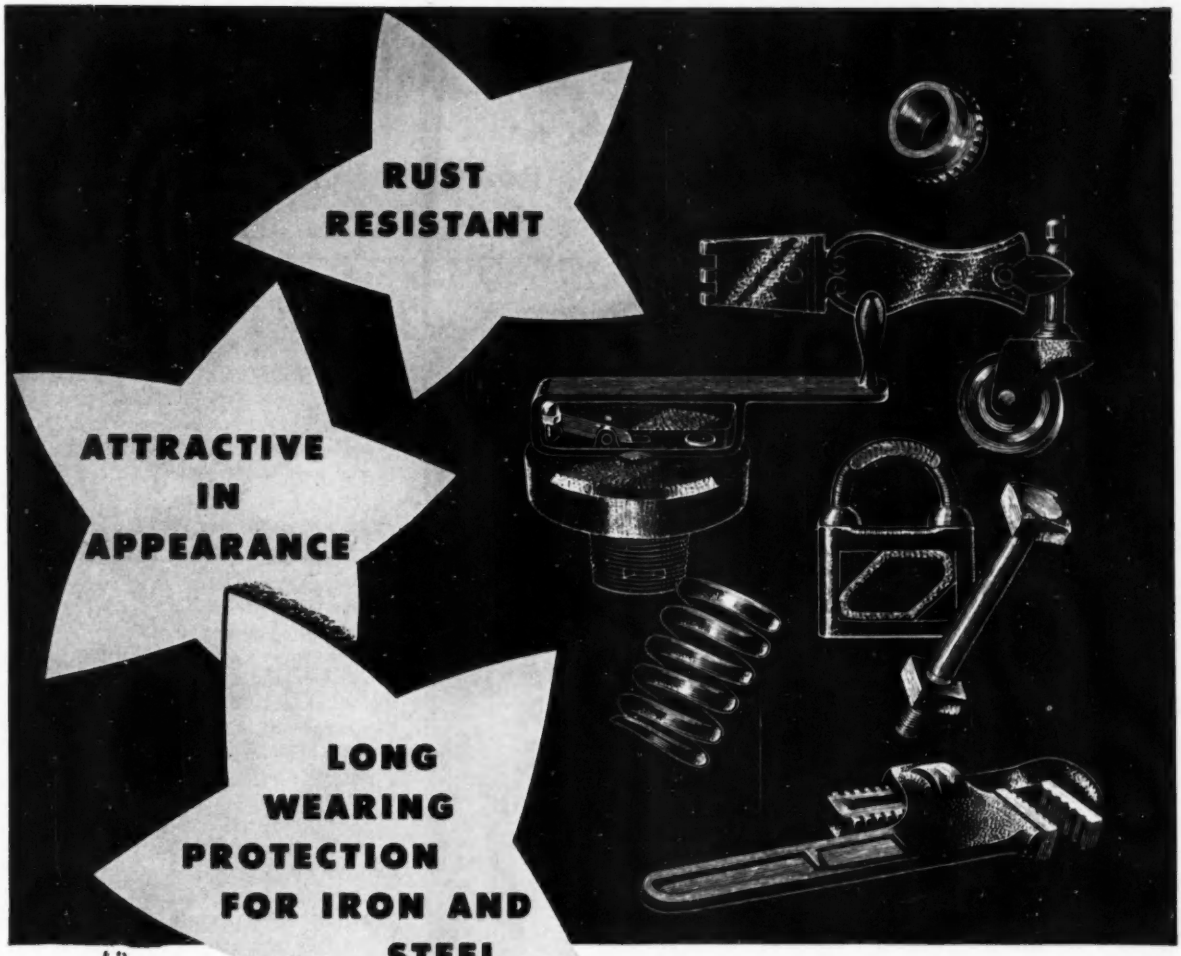
Improved Gas Turbine to Come from Rover

An improved version of the gas turbine engine soon will be offered by the Rover Co., Ltd., according to British reports. While still in the experimental stage, one of its predecessors, a 200-hp turbojet was one of the first used in an automobile when installed in the Rover Turbocar.

PAC Adds British Line

Pacific Airmotive Corp. has become exclusive U. S. distributor for aircraft equipment designed and manufactured by Sir George Godfrey and Partners,

(*Turn to page* 142, *please*)



— PARCO COMPOUND

Parco Compound, constantly improved over the past third of a century, now offers greatest efficiency and economy in the protection of iron and steel against rust and corrosion.

In addition to rust resistance, Parco Compound adds greatly to the attractive appearance of the treated parts. When it is combined with stains or oils, a very dark satin finish is produced. Treated metal may be waxed, or may be painted with excellent results.

While efficiency and flexibility has increased, cost is still extremely low. Treatment with Parco Compound is quick, simple, uniform, completely dependable. The only limitation on size of parts treated is the size of the processing tanks.

Parco Compound meets government specifications for military use, and is replacing cadmium and zinc in many civilian applications.

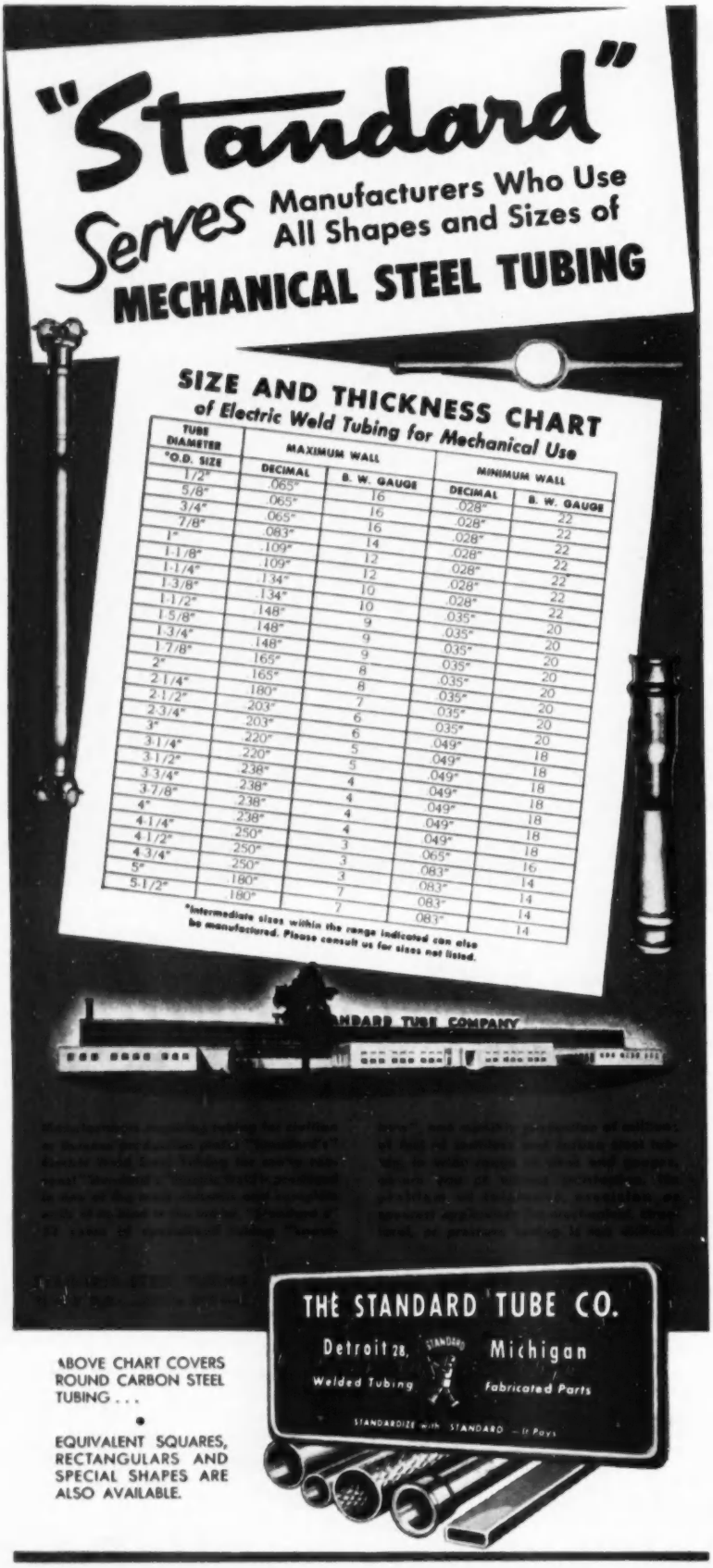
*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

SINCE 1915 — LEADER IN THE FIELD

PARKER

PARKER RUST PROOF COMPANY
2178 E. Milwaukee Ave.
Detroit 11, Michigan

BONDERITE—corrosion resistant paint base • BONDERITE and BONDERLUBE—aids in cold forming of metals • PARCO COMPOUND—rust resistant • PARCO LUBRITE—wear resistant for friction surfaces


"Standard"
Serves Manufacturers Who Use All Shapes and Sizes of
MECHANICAL STEEL TUBING
SIZE AND THICKNESS CHART
of Electric Weld Tubing for Mechanical Use
TUBE DIAMETER "O.D. SIZE
MAXIMUM WALL
DECIMAL
B. W. GAUGE
MINIMUM WALL
DECIMAL
B. W. GAUGE
1/2" .065" 16 .028" 22
5/8" .065" 16 .028" 22
3/4" .065" 16 .028" 22
7/8" .083" 14 .028" 22
1" .109" 12 .028" 22
1-1/8" .109" 12 .028" 22
1-1/4" .134" 10 .028" 22
1-3/8" .134" 10 .028" 22
1-1/2" .148" 9 .035" 20
1-5/8" .148" 9 .035" 20
1-3/4" .148" 9 .035" 20
1-7/8" .165" 8 .035" 20
2" .165" 8 .035" 20
2-1/4" .180" 8 .035" 20
2-1/2" .203" 7 .035" 20
2-3/4" .203" 6 .035" 20
3" .220" 6 .049" 20
3-1/4" .220" 5 .049" 18
3-1/2" .238" 5 .049" 18
3-3/4" .238" 4 .049" 18
3-7/8" .238" 4 .049" 18
4" .238" 4 .049" 18
4-1/4" .250" 4 .049" 18
4-1/2" .250" 3 .065" 18
4-3/4" .250" 3 .083" 16
5" .180" 3 .083" 14
5-1/2" .180" 7 .083" 14
7 .083" 14
*Intermediate sizes within the range indicated can also be manufactured. Please consult us for sizes not listed.
THE STANDARD TUBE COMPANY
ABOVE CHART COVERS ROUND CARBON STEEL TUBING . . .
EQUIVALENT SQUARES, RECTANGULARS AND SPECIAL SHAPES ARE ALSO AVAILABLE.
THE STANDARD TUBE CO.
Detroit 28, Michigan
Welded Tubing
Fabricated Parts
STANDARDIZE with STANDARD — It Pays

Industry News

(*Continued from page* 140)

Ltd., of England and its subsidiary, Godfrey Engineering Company, Ltd., of Canada. The Godfrey agreement is in addition to PAC's earlier contract with de Havilland Aircraft Company, Ltd., whereby PAC acts as exclusive servicing representative and main supplier of spare parts for the de Havilland Dove.

Under the terms of the new agreement, PAC will handle Godfrey aircraft turbo refrigeration equipment, cabin superchargers, aircraft fans, water separators, aircraft silencers and ground air-conditioners.

Magnesium Plant Offers Larger Sheet, Extrusions

Magnesium products in larger sizes than heretofor will be available from the new Madison, Ill., Div. of the Dow Chemical Co. The 1.25-million sq ft former Standard Steel Spring plant will have an 84 in. hot break down rolling mill and 84, 68, 36 and 18-in. cold finishing mills. One-ton ingots will be used to make coils and finished sheets in four-high mills. In addition, Dow is installing extrusion presses up to 5500-tons capacity. Extrusions up to 90 ft long, and pickled or aged alloys up to 45 ft long can be furnished. The plant will also make coiled welding rod, and sell alloy ingots. Many operations will be conducted on a mass production basis for the first time in the history of the magnesium industry.

Classic Car Club Honors Packard

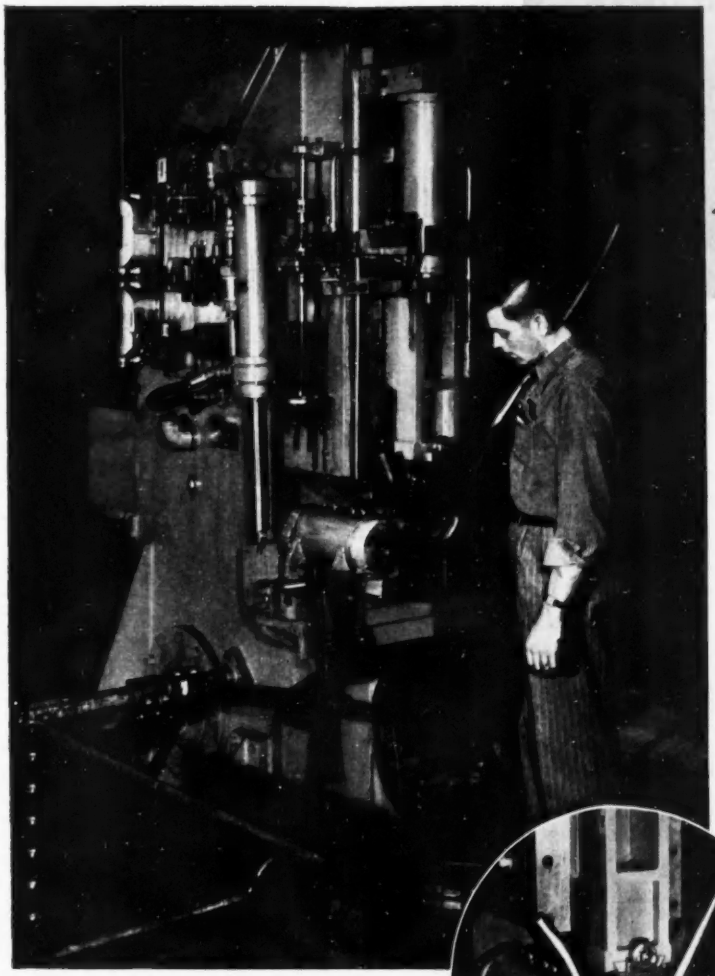
Newest addition to the roster of vintage automobile organizations is the Classic Car Club of America, organized late in 1952. The club, dedicated to preservation of foreign and domestic motor cars of the years 1925 to 1942, held its first annual motor tour in August, including a stop at Detroit where it awarded Packard a gold cup for classic styling and design. The caravan of 60 cars included a 1928 Bentley, 1930 Franklin, 1930 Stutz Durham V-16, 1929 Rolls Royce town car, 1932 Auburn-12 phaeton, 1938 Mercedes Benz cabriolet and other illustrious names such as Cadillac, Lincoln, Cord, Duesenberg, and Nash.

Practically all of the models are of the limousine or expensive sports types prevalent during the late '20s and '30s. Some members have spent as much as $10,000 to restore the cars.

New PINES 20-TON BENDING PRESS

PRODUCES AUTOMOTIVE EXHAUST PIPES

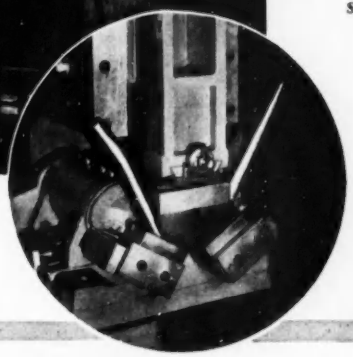
50% FASTER



▲ Production view of new Hydraulic Bending Press. Note angle-of-bend selector, side-mounted die cushion, panel-mounted valves, and oil cooler.

The new Pines 20-Ton Hydraulic Pipe and Tube Bending Press is now establishing new records of production efficiency on many different bending operations. For example, on automotive exhaust and tail-pipes, multiple bends with 4″ and 6″ radii are now produced in 1-1/4″ to 2″ O.D. 16 ga.-18 ga. tubing at speeds ranging from 600 to over 800 bends per hour.

On an over-all basis, current results show these jobs are produced 50% faster than with ordinary bending press equipment. At the same time, because of the design of the Pines, savings up to 30% in setup time are effected. Further, because more jobs can be handled in a single setup, there's a substantial reduction in tooling expense. If you have work adaptable to a bending press, it will pay you to see Pines today.



◀ Closeup view of Pines Bending Press forming 4th bend in a 1⅝″ (16 ga.) CRS automotive exhaust pipe. Note how wing dies are controlled by side-mounted cushions through heavy crank arms. Interchangeable pick-off turret of angle-of-bend selector saves set-up time on repeat jobs.

CHECK THESE COST-CUTTING PRODUCTION FEATURES

- ✔ **Twin Equalizing Side-Mounted Cushions** — provide greater working clearance, maintain constant torque, reduce flattening and distortion.
- ✔ **Faster Cycling** — angle-of-bend selector indexes and resets to starting position automatically without indexing through idle stations, increases output.
- ✔ **Greater Work Handling Capacity** — extra clearance reduces number of setups on multiple bending, permits broader use of uniform radii, cuts tooling and production costs.
- ✔ **Interchangeable Pick-Off Turret** — for angle-of-bend control. Permits storing and remounting for repetitive jobs, reduces setup time.
- ✔ **Adjustable Ram Speed Control** — assures efficient operation, simplifies setups. Ram can be lowered slowly or stopped at any point.

WRITE FOR NEW 4-PAGE BULLETIN

Write today for free bulletin completely illustrating and describing the new Pines Bending Press and its cost-cutting production features.

PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery | 656 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

LORD MOUNTINGS Protect Vital Parts on EVERY TYPE of AIRCRAFT

SAE National Aeronautic Meeting
Hotel Statler—Booth No. 21
Los Angeles, California
Sept. 29-Oct. 3, 1953

Choice of the Leading Builders of Aircraft-

FOR more than a quarter century Lord Headquarters for Vibration Control have designed and manufactured bonded-rubber mountings to protect vital aircraft components from vibration and shock . . . to improve the overall operation of aircraft . . . to contribute to passenger and crew comfort. Among the many well known Lord Mountings in the Aviation Industry are (1) Dynafocal Engine Suspensions (2) Instrument Panel Mountings (3) Antennae and Electronic Equipment Mountings (4) Cowl Mountings (5) Actuator Attachment Mountings. There are many others.

We invite you to take advantage of Lord experience in vibration control . . . Ask about maintenance cost savings effected by Lord Core Renewal Service on Dynafocal Suspensions.

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PHILADELPHIA 7, PENNA. 725 Widener Building

LORD MANUFACTURING COMPANY • ERIE, PA.

LORD BONDED RUBBER

Headquarters for VIBRATION CONTROL

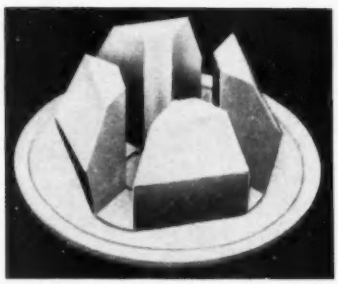
New Products

For additional information please use postage-free reply card on page 89

(*Continued from page* 88)

Plastic Hole Plugs

Now available is a plastic hole plug used to close holes in a variety of products, including automobiles. It is said to be available in a large variety of sizes and colors and is designed to snap easily into round or square holes.



In production processes, it is often necessary to provide holes to facilitate assembly line operations such as rack plating, spraying and to provide easy access to internal parts. These holes must be closed before the product can be completed. No special tools are required to install the plug for it is easily pressed into the hole by hand.

One typical automotive use is the plugging of a hole in the liner behind the dash panel. After the plug is inserted, the unit is painted to provide a moisture-proof seal.

The plugs are available to seal holes ranging from ⅛ in. to more than one in. in diameter. *Shakeproof Div., Illinois Tool Works.*

Circle 40 on page 89 for more data

Molding Compound

Now available is a mineral-filled phenolic molding compound, known as 16274 Natural, for molding parts requiring high dielectric properties. This material is said to have a low dissipation factor and low water absorption qualities. It is obtainable in two plasticities, one recommended for compression molding and the other for plunger or transfer molding. *Durez Plastics & Chemicals, Inc.*

Circle 41 on page 89 for more data

(*Turn to page* 146, *please*)

Wings in the sky!

Wheels on the ground!

. . . FOR PEACE WITH SECURITY!

Long, long, long before the planes soar or the caissons roll . . . quiet, thoughtful men begin their patient research, study, planning, designing . . . to produce at last the myriad precision parts, assemblies and products needed by the aircraft and ordnance industries.

Today ninety per cent of our defense work . . . in research, design, engineering development and production . . . is on aircraft or ordnance contracts, for one part or a million, to be made with the utmost of painstaking precision.

These parts, assemblies and products . . . most often unseen and unsung . . . are the secrets of dependable performance of many weapons. Hence, they very greatly increase our positive power to defend the peace and security of America.

THE STEEL PRODUCTS ENGINEERING CO.

engineers and manufacturers
Springfield, Ohio

Reflectoscope TESTING

is available in your plant...
AS YOU NEED IT!

SPERRY INSPECTION SERVICE now makes fast, dependable, non-destructive testing available for every plant. You can have an experienced inspection engineer using a Sperry Reflectoscope — when you need them — for any desired length of time from four hours up.
Practically every type of material can be tested; hidden defects are quickly and reliably located in up to 30 feet of solid steel. Parts may be checked without dismantling. Write now for complete information.

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MATERIAL TO BE TESTED_____
NAME_____
TITLE_____
COMPANY_____
CO. ADDRESS_____
CITY_____
ZONE_____ STATE_____

New Products

For additional information please use postage-free reply card on page 89

(*Continued from page* 144)

Rubber-Plastic Materials

Now available are rubber and plastic materials for chemical, electrical, and mechanical applications. They are known as Ace-Flex, Ace-Riviclor and Dur-Ace, respectively.

Ace-Flex is a light-weight plastic material that is said to have good electrical properties and chemical resistance. It is available as flexible tubing and sheet for such applications as battery separators.

Riviclor is an unplasticized thermoplastic that is reputed to have good chemical resistance, impact strength, and fabricating charateristics. It is now being used for pipe, fittings, tank linings, formed and molded pump and valve parts and similar products.

Dur-Ace is a thermoplastic, multi-polymer material with reportedly high impact strength and dimensional stability, and good chemical resistance. It is said to be very suitable for formed and draw-molded parts, as well as for pipe, fittings, and machined parts. *American Hard Rubber Co.*

Circle 42 on page 89 for more data

Passenger Tire

Now on the market is a nylon passenger tire for high-speed driving that is said to be extremely resistant to ruptures. In addition to individual safety slots across the tread, it has sharp rib edges around the tire to help prevent lateral skids. *Fisk Div., U. S. Rubber Co.*

Circle 43 on page 89 for more data

12-v Lighter

A long-lasting lighting temperature is the prime feature claimed for a 12-v lighter recently announced. Designed for both front and rear seat installation on 1953 GM cars, the lighter is said to require 30 per cent less current flow. *Rochester Products Div., General Motors Corp.*

Circle 44 on page 89 for more data
(*Turn to page* 148, *please*)

Get True Mileage Records with PE-KA Driveless Hubodometers

ANY WHEEL OR TIRE SIZE

Pe-Ka Driveless Hubodometer gives you actual mileage traveled by rented, leased or exchanged rolling stock, and for State and ICC ton-mile regulations.

★

Completely sealed. Tamperproof. Oilness bronze bearings assure long life.

★

Installed in a few minutes on rear or front wheels. Send for details.

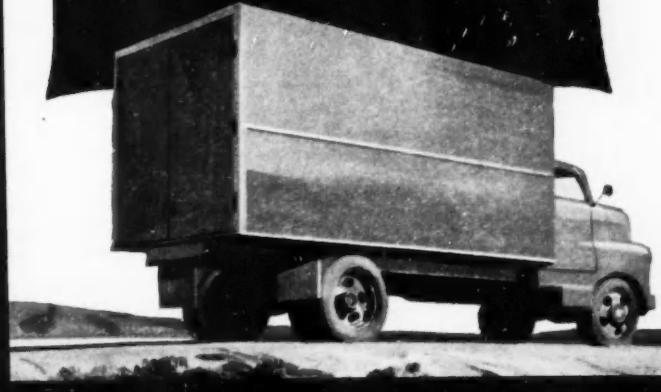
ENGLER INSTRUMENT CO., 258 Culver Avenue, Jersey City, N. J.

the EXTRA BRAKING CONTROL proven here...

Powerful Bendix-Westinghouse Air Brakes Provide Sure, Dependable Stops for Rugged Diesel Tankers!

Imagine this if you can. You're behind the wheel of a heavy diesel tanker headed north toward San Francisco over California's rugged coastal ranges. Here, in addition to normal hazards of the highway, you'll encounter mile after mile of steep downgrades and sharp, tight curves that at times **require maximum braking performance.** But you're prepared, on this imaginary journey of yours, because if you're anything like the men who *actually do* travel this route, you're equipped with Bendix-Westinghouse—the world's most tried and trusted air brakes. That's because these **mighty brakes,** built by the industry's most experienced manufacturer, deliver the extra stopping power and performance that assure the **safest, surest, most dependable braking control** and longest service life in the business. And these are factors that mean reliable, economical operation on any hauling job—from the roughest to the most routine! So why not give your prospective truck customers all the benefits of this superior braking performance and the savings that go with it? Specify Bendix-Westinghouse, the world's most tried and trusted air brakes!

...means GREATER RELIABILITY on any hauling job!



Bendix-Westinghouse

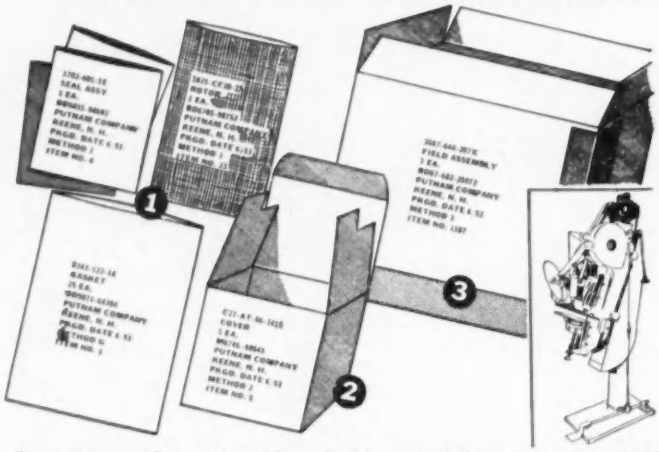
THE WORLD'S MOST TRIED AND TRUSTED

AIR BRAKES

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • ELYRIA, OHIO • BERKELEY, CALIF.

MARKEM SOLVED THIS MARKING PROBLEM

IDENTIFICATION MARKING
FOR CONTRACT AND OVERSEAS PACKING



In contract and export packing of parts, assemblies, etc., certain JAN specifications call for three packaging stages: (1) enclosure in scrimback or polyethylene lined *heat sealing* envelope, (2) intermediate packing in a folding box, (3) final packing in corrugated carton. Each of these three types of containers must be marked for instant and *permanent* identification. Many manufacturers, dissatisfied with conventional marking with crayon, stencil, labeling or other form of hand stamping, have not only found great savings in time and money, but also obtained more legible, longer lasting identification using a Markem Method. *One* Markem machine (with appropriate Markem type and Markem ink) prints desired information on *all three* containers. The vapor barrier of the envelope is not broken. Desired information is changed rapidly. By printing quantities of containers as and when needed, inventory problems are minimized. In this way, the Markem Method insures *positive identification* when the items reach their destination.

MARKEM® MARKS THEM ALL

CAN MARKEM HELP YOU? Identification printing for contract and overseas packaging is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure *continued* satisfaction with Markem methods and equipment.

When *you* have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem Method has already been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 8, N. H., U.S.A.

MARKEM ...TO MAKE YOUR MARK

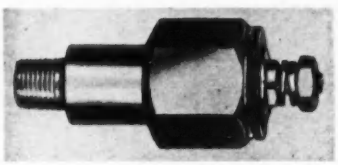
New Products

For additional information please use postage-free reply card on page 89

(*Continued from page* 146)

Air Pressure Warning Switch for Vehicles

Recently announced is an air pressure warning switch for bus, truck, and truck-tractor applications. The unit closes the circuit when air pressure drops below 60 lb and either lights a multi-facet red lens or sounds a buzzer mounted on the panel within easy vision and hearing of the driver.

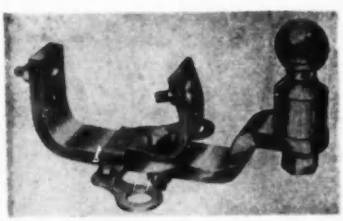


The warning device is installed by connecting a "T" fitting into the air line leading to the panel gage, preferably at the tank connection. The light is mounted on the panel near the air gauge with one terminal connected to the ignition switch and the other to the warning switch terminal. *Instrument Div., Stewart-Warner Corp.*

Circle 45 on page 89 for more data

Automobile Hitch

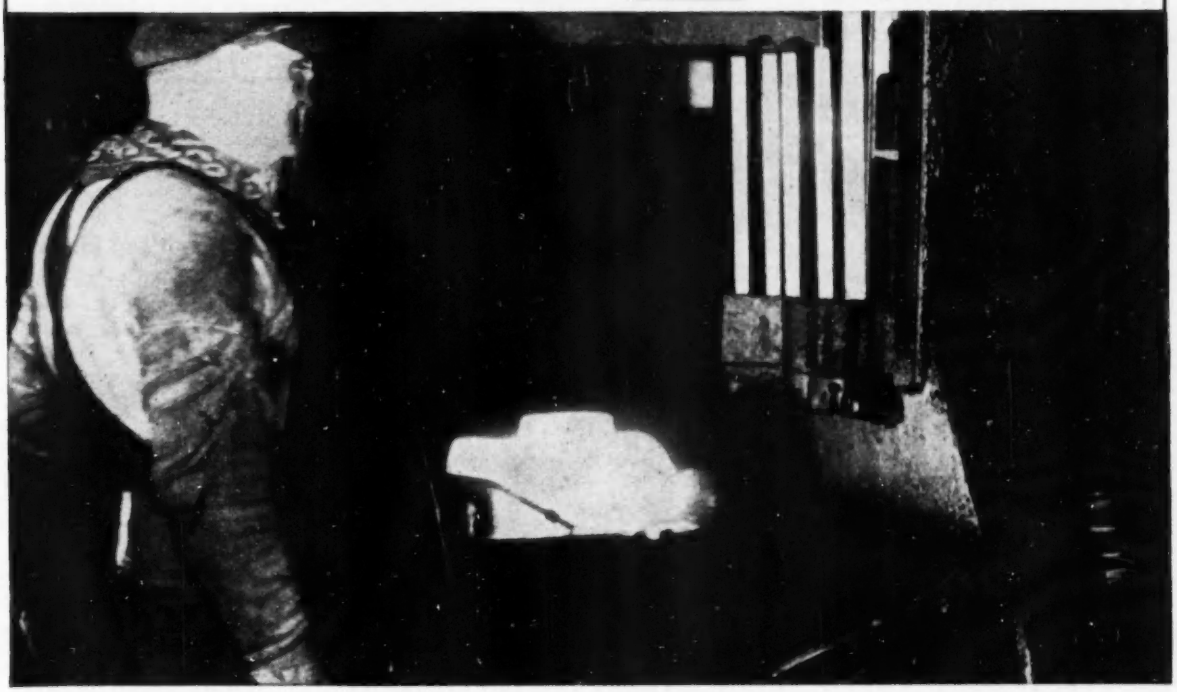
Now available is an automobile hitch, called the Quick-Lock, for all makes of cars from 1946 through 1953. It is said to accommodate all trailers up to 4000-lb loads when tie-rods are used.



No welding is required, and an adapter plate is provided to accommodate safety chains. *Foreman Manufacturing Co.*

Circle 46 on page 89 for more data
(*Turn to page* 150, *please*)

Custom made for your forging job



Another reason why you get uniform, high quality forgings with TIMKEN® forging steels!

YOUR order for Timken® forging steels is handled individually in our mills. Conditioning procedure is targeted to your particular forging requirements. You get just the steel you want for uniform forgings, rejects are held to a minimum. And you save steel, because the good dimensional tolerances of Timken steel forging bars produce uniform weight multiples with minimum steel lost in flashings.

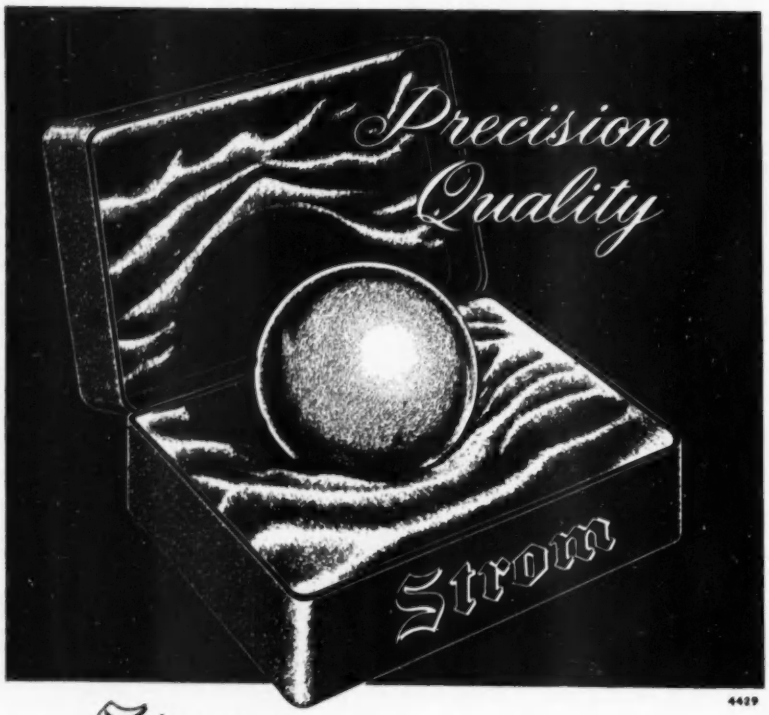
Timken forging steels give you uniform physical properties. They respond uniformly to heat treatment—from bar to bar and heat to heat. Fewer furnace adjustments are needed. And Timken forging steels have uniform grain size after heat treatment. Result: your forgings have uniformly high ductility and resistance to impact.

Chemical properties, too, are kept uniform in every lot of Timken forging steels by some of the most precise quality control methods known. For example, a direct-reading spectrometer—first of its kind in the steel industry—chemically analyzes a molten heat of Timken forging steel in just 40 seconds! And the melt shop has the complete analysis report within 10 minutes!

For help in improving the quality of your forgings, and cutting production costs, too, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



4429

Strom STEEL BALL CO.

Largest Independent and Exclusive Metal Ball Manufacturer

1850 SO. 54th AVE., CICERO 50, ILLINOIS

New Products

For additional information please use postage-free reply card on page 89

(*Continued from page* 148)

Aluminum Welding Flux

Recently announced is an aluminum welding flux that is said to allow the operator to see exactly what he is doing while welding. Known as Type 202, its outstanding advantage is reported to be the effectiveness of its fluxing action, as the weld puddle is not hidden behind an opaque blanket of refractory slags. *Solar Aircraft Co.*

Circle 47 on page 89 for more data

Swivel Shoe Set

Now available is a swivel-shoe set that is said to be adaptable to any type of tool, jig or fixture. It reportedly provides positive holding without marring, scratching, or burring the held part. *Allied Air Parts.*

Circle 48 on page 89 for more data

G&O
Radiators
88th Year

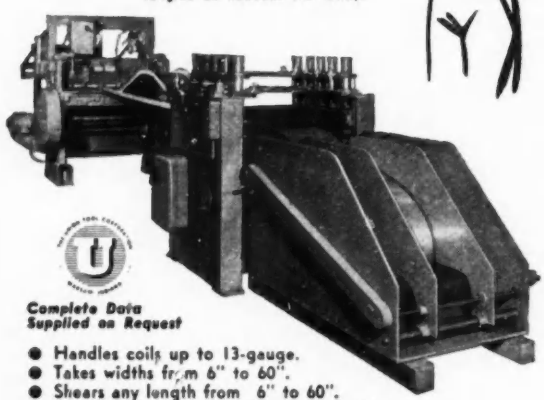
ENGINE COOLING RADIATORS
•
HEATERS
•
OIL COOLERS
•

THE G&O MANUFACTURING CO.
NEW HAVEN CONNECTICUT

WITH ONLY ONE OPERATOR
THIS UNION MACHINE

- DE-COILS
- LEVELS
- SHEARS
- STACKS

CUTS LABOR COSTS
AUTOMATICALLY
CUTS MATERIAL COSTS
Buy in coils and cut sheet lengths as needed. No delay.



Complete Data Supplied on Request

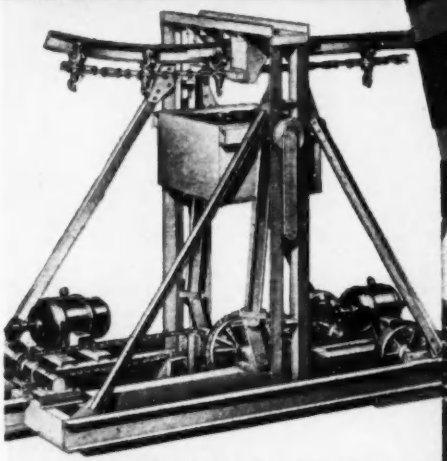
- Handles coils up to 13-gauge.
- Takes widths from 6" to 60".
- Shears any length from 6" to 60".
- Tolerance held to only + or — 1/64".
- Only one adjustment to change lengths.
- Speeds to 150 l.f.p.m. depending on lengths cut.
- Neatly stacks sheared pieces automatically.
- Will handle steel, aluminum, etc.

UNION TOOL CORP.
322 E. MARKET ST., WARSAW, IND., U. S. A.

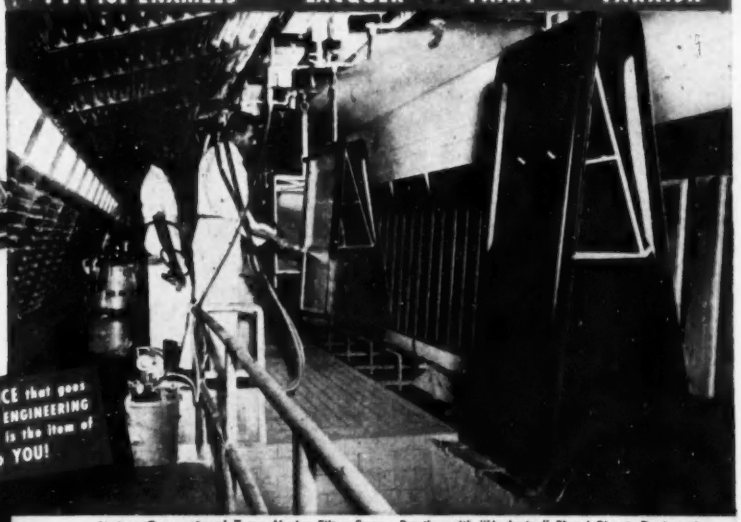
USERS SAY UNION CUTS COSTS, SPEEDS PRODUCTION

COMPLETE *Finishing* SYSTEMS

. . . . for ENAMELS • LACQUER • PAINT • VARNISH



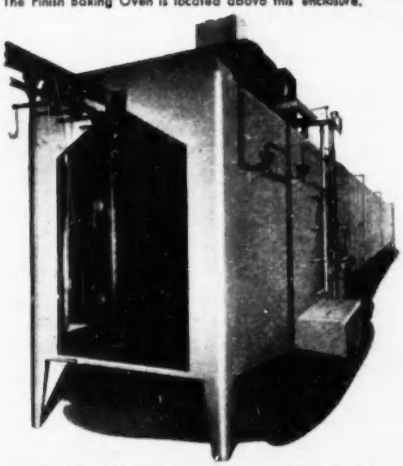
Mahon Automatic Dip-Coating Machine. Paint tank moves up and forward at conveyor speed to immerse parts. It then lowers away and moves back to its original position and repeats. Paint Level and Temperature is maintained by continuous circulation through Flexible Lines.



Mahon Conventional Type Hydro-Filter Spray Booths, with "Hydraire" Flood Sheet, Designed to meet the Specific Requirements of a Home Appliance Manufacturer.

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

Interior View of Typical Mahon Dip-Coating equipment. The Finish Baking Oven is located above this enclosure.



Typical Mahon Flow Coating Machine and Drip Tunnel. Automatic controls and equipment can be provided to maintain constant temperature of coating material.

Should YOUR PRODUCT be SPRAYED, DIPPED or FLOW COATED? or does it demand a COMBINATION of these COATING METHODS?

In some plants, where our advice on finishing methods has been sought, we have found parts being flow coated when substantial savings could have been effected in the over-all finishing costs through the employment of the dip method—savings in thinner, paint, initial cost of equipment and maintenance...and the dip method, in this particular operation would have provided a better finish with fewer rejections. It is therefore wise to get expert advice when confronted with a finishing problem, regardless of what the part or product may be. Many factors enter into the basic and all-important decision on method or combination of methods to be employed to produce the finest results at the lowest possible unit cost. Mahon engineers, with a background history covering thousands of complete finishing systems—including Dip, Flow Coating and Spray Equipment—are in a position to make sound, unbiased recommendations on the "HOW" to finish any product under any conditions or production requirements. Over thirty years of experience in planning, designing, building and installing finishing systems of every type for every conceivable product painted on a production basis, has equipped Mahon engineers with a wealth of technical knowledge and practical know-how not available to you elsewhere . . . can you afford to rely on less when so much is at stake? See Mahon's Insert in Sweet's Plant Engineering File, or write for Catalog A-654.

THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 34, Mich. • WESTERN SALES DIVISION, Chicago 4, Ill.

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling, and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, and Drying and Baking Ovens; Core Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other units of Special Production Equipment.

MAHON

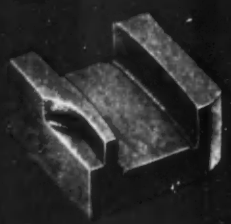
an easy way to cut your production costs

OILITE does it—

with FINISHED MACHINE PARTS

machining this segment costs ..... $.70

OILITE segments cost ..... $.08



machining this mating slider costs $1.30

OILITE slides cost ..... $.07

Other Advantages Include:

- No investment in machine tools
- No costly tooling programs
- Releases skilled manpower to other jobs
- No material supply problems

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FIELD ENGINEERS AND DEPOTS THROUGHOUT UNITED STATES AND CANADA

Oilite Products Include: Bearings, Finished Machine Parts, Cored and Solid Bars, Permanent Filters and Special Units.

PRODUCTION Soars 240%

with TOCCO* Induction Heating

PRODUCTION UP. When Thompson Products Ltd., St. Catharines, Ontario switched from conventional hardening methods to TOCCO Induction hardening production of their mine drill bits increased from 250 to 600 per hour!

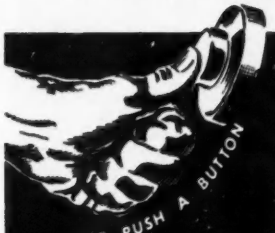
COSTS DOWN. While production skyrocketed, costs fell—from $7.46 per hundred parts to $6.50, a savings of almost exactly one cent per part on the hardening operation alone.

OTHER ADVANTAGES. Moreover, additional savings resulted from not having to haul the forged drill bits to and from the heat-treat department. Cool, clean TOCCO fits right in the production line—takes only ¼ the space of rotary hearth furnace previously used.

In Canada or United States TOCCO Engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

This Mine Drill Bit is made of .90 carbon drill steel. Cutting face is hardened to 65 R. C. Thompson also uses TOCCO to heat stock for forging these parts.

THE OHIO CRANKSHAFT COMPANY



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Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

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For America's most honored *Guests*

At no other place and at no other time in 1953 will the power and vitality and productive genius of the vast and basic metals industries of America be so forcefully and so clearly demonstrated as in Cleveland's Public Hall this October.

Here . . . in bold, animated, live-action display will be the newest . . . the finest . . . the most wanted developments . . . and here, too, will be the alert, the wise, the idea-seeking men who make the metals industries go forward.

NATIONAL METALS EXPOSITION AND CONGRESS

Cleveland, Ohio, Oct. 19-23

PARTS LIKE THESE

are produced better . . . at lower cost *by* ALLIED'S COLD FORGING METHODS

Shown at the right in actual size is one of the many cold forged parts being produced by Allied.

By no other method could this particular part, or any of the other parts illustrated above, be manufactured as economically as by cold forging. However, to produce such parts requires ingenious engineering and production methods . . . and it is at Allied where you will find the best examples of cold forging ingenuity at work.

If you have need for parts similar to these . . . if you require tolerances as close as may be required for most machined parts . . . if you want maximum strength and durability in the parts produced . . . it will pay you to investigate what Allied can do for you. Send your part prints for quotation.

Other Allied Products

HARDENED AND PRECISION GROUND PARTS
SHEET METAL DIES PRODUCED IN IRON, ALLITE (ZINC ALLOY) AND PLASTIC • R-B INTERCHANGEABLE PUNCHES AND DIES

STANDARD HEXAGON HEAD CAP SCREWS

Also produced by Allied are standard hexagon head cap screws. They are of uniformly high quality and are priced competitively. Your inquiry will receive prompt attention.

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ALLIED CORPORATION PRODUCTS

ALLIED PRODUCTS CORPORATION

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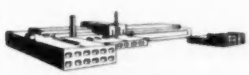
Detroit, Mich.



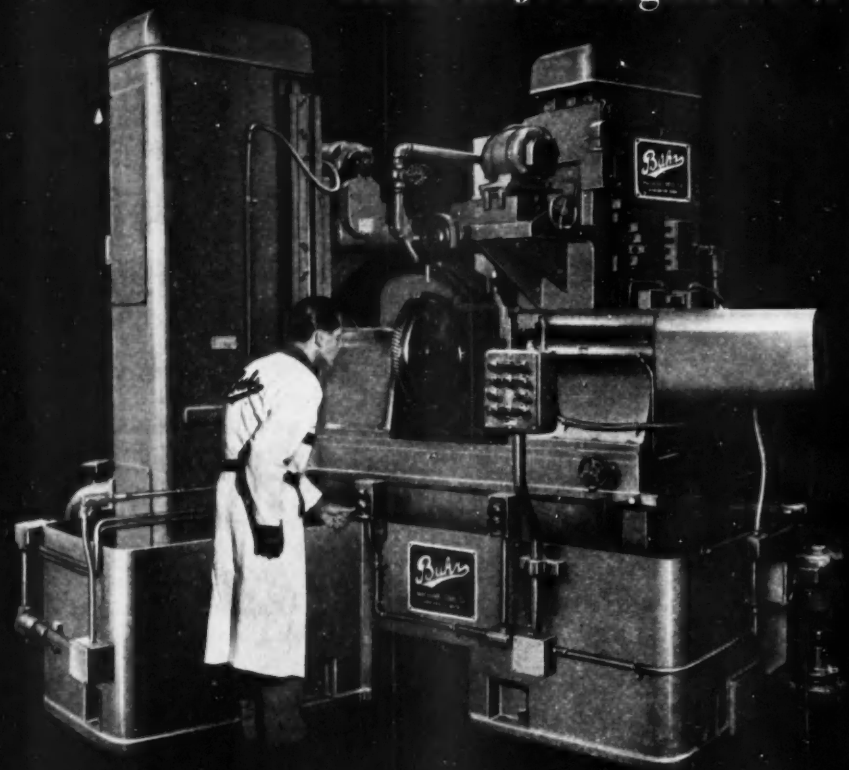
PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

Buhr SPECIAL...

Mills both ends of 57 up to 103 slots in 16 different Jet Engine Rotors



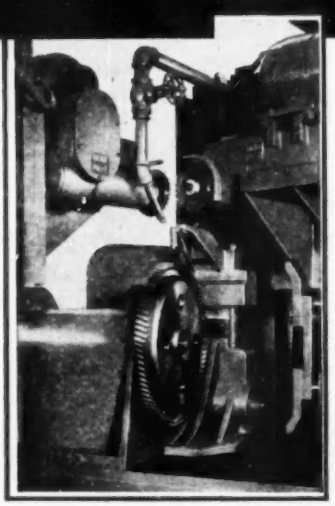
Automatic 2-spindle milling machine, arranged with automatic index for milling both ends of dove-tailed slots.

Equipped with hardened and ground laminated tool-steel ways.

Hydraulic and electrical installations to J.I.C. standards.

Automatic index unit arranged for milling the various stages from 57 up to 103 slots.

Once machine is set up for any one part, operation is fully automatic, including stop when part is finished.



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ANN ARBOR, MICHIGAN

Buhr **MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY**

Leaders in the Automotive field
use H&H METALFLO for Car Heater Tubing and other parts
Where can H&H METALFLO* THE BRAZED BRASS TUBING help you build a better product for less money?
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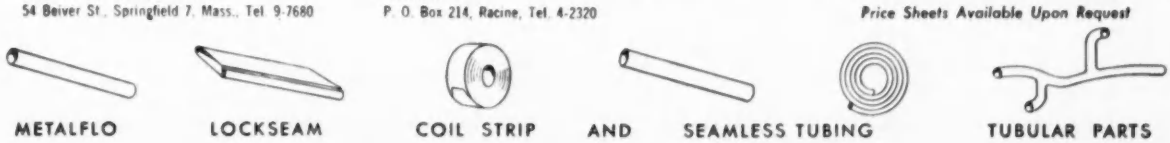
5/16 thru 5/8	x	.015 to and including .025
5/8 thru 1 3/16	x	.012 to and including .035
1 3/16 thru 1"	x	.015 to and including .035
1" thru 1 1/16	x	.020 to and including .035
1 1/16 thru 1 1/8	x	.025 to and including .035
1 1/8 thru 1 3/16	x	.032 to and including .035

Price Sheets Available Upon Request



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for close-up visual inspection of internal surfaces and hidden parts

A.C.M.I. Borescopes are available in 4 angles of vision (as above)—in diameters of .120" to 4.00"—in lengths of 4" to 720". Special models for special problems.

A.C.M.I. Borescopes permit close-up visual examination of interior areas and surfaces not otherwise visible. They save time and money, and prevent costly dismantling. • Each Borescope is a compact, self-illuminated industrial telescope of highest quality, employing a precision optical system, that produces a flat visual field. Lens systems are fully corrected for color, spherical aberrations, and coma, with all lens surfaces coated to increase light transmission

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See our full page "ad" in the STATISTICAL ISSUE p. 399

*A Message to Engineers from Walter Tydon**

"A secure future, exceptional opportunities for advancement, and a high starting salary await you at FAIRCHILD, if you are one of the men we are looking for. We have openings right now for qualified engineers and designers in all phases of aircraft manufacturing; we need top-notch men to help us in our long-range military program: turning out the famous C-119 for the U. S. Air Forces.

"FAIRCHILD provides paid vacations and liberal health and life insurance coverage. We work a 5-day, 40-hour week.

"If you feel you are one of the men we are looking for, write me. Your inquiry will be held in strictest confidence, of course."

Walter Tydon

**Walter Tydon, widely known aviation engineer and aircraft designer and veteran of 25 years in aviation, is Chief Engineer of Fairchild's Aircraft Division.*

ENGINE AND AIRPLANE CORPORATION
FAIRCHILD *Aircraft Division*
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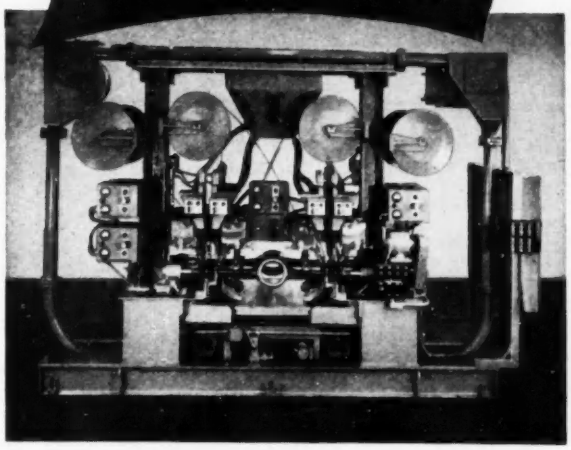
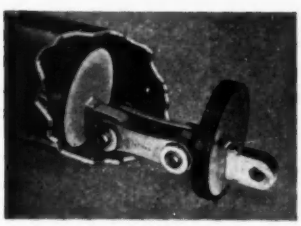
are always well
Informed

how might YOU apply



Hapman

TUBULAR CONVEYORS



to improve equipment you buy or build?

As an example, look at this Expert Automatic Submerged Arc Welder. While six welds are made simultaneously, the Hapman rubber-flighted, sealed-pin Chain Conveyor picks up unused flux at bottom and returns it to hopper at top for re-use.

Other flux-return methods were tried. But for low operating and maintenance costs, the Hapman Conveyor proved its advantages.

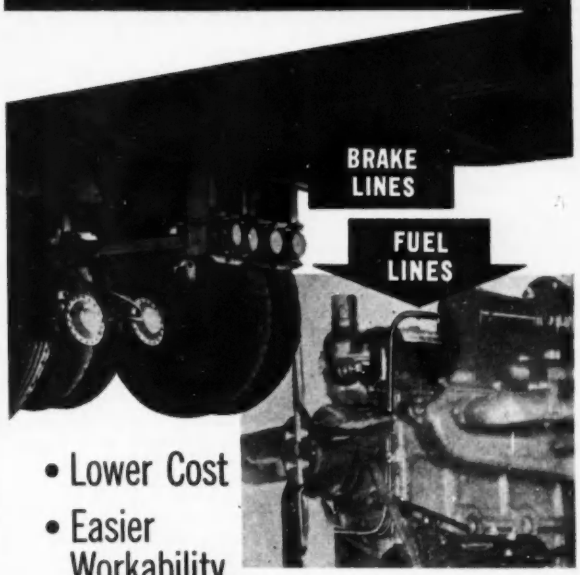
Will Hapman Conveyors handle metal chips? Sludge? Slag? Sand? *Yes,* they'll carry almost *any* flowable material — through any plane or any angle — with minimum clearance and support.

Exclusive Hapman construction — engineered to your application — offers you unique advantages. Get full details — today!

Write for your copy of Hapman Catalog AI-953 for details and applications

Hapman CONVEYORS, INC.
DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO MICHIGAN

Use ALCOA Utilitube for



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- Easier Workability
- Higher Fatigue Strength with

Alcoa Utilitube

ALCOA Utilitube* is corrosion-resistant aluminum coiled tube made of a special alloy (50S). It is ideal for carrying air for instrument and brake lines—gasoline and fuel for internal combustion engines—lubricating oil for engines and machines—fluids for hydraulic systems. It actually *offers you initial savings up to 40 per cent* over copper.

ALCOA Utilitube bends more easily than annealed copper . . . work hardens less . . . has excellent flaring and forming characteristics. It will not cause sludge or gum formations. It resists corrosion and in extremely low temperatures its mechanical properties actually improve.

For economy, specify ALCOA UTILITUBE.

ALUMINUM COMPANY OF AMERICA
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For complete information write for the new booklet "ALCOA UTILITUBE"

Aluminum tube fittings are available NOW from leading tube fitting distributors

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Index to

The Advertisers' Index is published as a convenience, care will be taken to index correctly. No allowance

A

AC Spark Plug Div. ..... —
Acadia Div. Western Felt Works ..... —
Ace Plastic Co. ..... —
Acushnet Process Company 102
Aeroquip Corporation ... 26
Aetna Ball & Roller Bearing Co. ..... —
Airborne Accessories Corp. 114
Airtex Products, Inc. ... —
Ajax Manufacturing Co., The ..... —
Allegheny - Ludlum Steel Corp. ..... —
Allen Mfg. Co. ..... —
Allied Products Corp. .. 155
Allison Division GM .... —
Allmetal Screw Products Co., Inc. ..... —
Aluminum Co. of Amer.. 159
Aluminum Industries, Inc. 21
American Bosch Corp. .. —
American Brakeblok Div. —
American Broach & Machine Co. 27
American Chain & Cable Co. ..... —
American Chemical Paint Co. ..... —
American Cystoscope Makers, Inc. 158
American Machine & Foundry Co. ..... —
American Non-Gran Bronze Co. ..... —
American Society for Metals 154
American Steel Foundries 76
Amplex Div. Chrysler Corp. 152
Apex Machine & Tool Co. ..... —
Armstrong Cork Co. .... —
Aro Equipment Corp. ... —
Associated Spring Corp.. —
Automatic Spring Coiling Co. ..... —
Automotive Gear Works —

B

Babcock & Wilcox Co., Tubular Products Div. —
Baird Machine Co., The 5
Bakelite Co., Div. Union Carbide & Carbon Corp. 45
Baldwin-Lima-Hamilton Corp. ..... —
Barber-Colman Co. ..... —
Barnes Co., Wallace .... —
Barnes, W. F., & John.. —
Barnes-Gibson-Raymond —
Bendix Aviation Corporation
Bendix Products Div.. 30
Eclipse Machine Div... —
Scintilla Magneto Div. —
Stromberg-Elmira Div. —
Zenith Carburetor Div. —
Bendix-Westinghouse Automotive Air Brake Co. 147
Bethlehem Steel Co. ... 11
Black & Decker Mfg. Co. —
Bliss Co., E. W. ..... —
Blood Bros. Machine Co. 103
Bodine Corporation, The 137
Borg & Beck Div. ..... —
Borg-Warner Corp. ..... —
Bowser Technical Refrigeration ..... —
Brainard Steel Div. ..... —
Brown Corp., The 116
Brush Electronics Co. .. —
Buckeye Tools Corp. .... —
Buhr Machine Tool Co... 156
Builders Steel Supply Co. 158
Bullard Company, The .. 6
Bundy Tubing Company —
Burdette Mfg. Co. ..... —
Burton Auto Spring Corp. ..... —

C

C.A.V. Division of Lucas Electrical Services, Inc. 130
Camcar Screw & Mfg. Corp. ..... —
Campbell Co., A. S. ..... —
Campbell, Wyant & Cannon Foundry Co. ..... —
Carboloy Dept. of General Electric Co. ..... —
Cardox Corp. ..... —
Chambersburg Engineering Co. ..... —
Chandler Products Corp. —
Chicago Rawhide Mfg. Co. ..... —
Chicago Rivet & Machine Co. ..... —
Chicago Screw Co., The. —
Chrysler Corp. (Amplex Div.) 152
Cincinnati Milling Machine Co. 32
Clark Bros. Co. ..... —
Clark Equipment Co. ... —
Clearing Machine Corp... —
Clearprint Paper Co. .... —
Cleveland Container Co. —
Cleveland Metal Abrasive Co. ..... —
Cleveland Pneumatic Tool Co. 129
Cleveland Punch & Shear Wks. Co., The ..... —
Climax Molybdenum Co. 114
Columbia-Geneva Steel Div. ..... —
Cone Automatic Machine Co., Inc. ..... —
Connecticut Hard Rubber Co. ..... —
Continental Diamond Fibre Co. ..... —
Continental Motors Corp. —
Continental Screw Co. .. —
Continental Tool Works Div. ..... —
Coolidge Corp. ..... —
Copperweld Steel Co. ... 91
Cotta Transmission Co.. 1
Cross Company, The 12
Cummins Engine Co. .... —

D

Danly Machine Specialties, Inc. 9
Davis & Thompson Co. .. —
Delco Products Div. G.M. ..... —
Delpark Corp. 15
Detrex Corp. ..... —
Detroit Aluminum & Brass Corp. ..... —
Detroit Stamping Co. ... —
Detroit Steel Products Co. ..... —
Disston & Sons, Inc., Henry ..... —
Do-All Co., The ..... —
Doehler-Jarvis Div. National Lead Co. ...24-25
Dole Valve Co., The..... —
Dollinger Corp. ..... —
Donaldson Co., Inc. ..... —
Dow Corning Corp. ..... —
Dow Furnace Co. ..... —
Dumore Co. ..... —
Dunbar Brothers Co. ..... —
du Pont de Nemours & Co., Inc., E. I. 47
Dykem Co., The ..... —
Dynamatic Corp. 8

E

Eaton Manufacturing Co. 8-77
Ekstrom, Carlson & Co.. —
Elastic Stop Nut Corp... —
Elco Tool & Screw Corp. —
Electric Auto - Lite Co., The ..... —
Electric Furnace Co., The —
Electric Storage Battery Co. 7
Elmes Engineering Div. 76
Elwell-Parker Electric Co. ..... —
Engler Instrument Co. .. 146
Evans Products Co. 105
Ex-Cell-O Corp. 101
Excelsior Leather Washer Mfg. Co. ..... —

F

Fafnir Bearing Co. .... —
Fairchild Engine & Airplane Corp. 158
Fairfield Mfg. Co. ..... —
Farquhar Div., A. B. .... —
Federal-Mogul Corp. ... —
Fellows Gear Shaper Co., The 42-43
Fitzgerald Mfg. Co., The —
Flexonics Corp. ..... —
Foote-Burt Company, The ..... —
Fostoria Pressed Steel Corp. ..... —
Frenchtown Porcelain Co. ..... —
Frontier Bronze Corp. .. —
Fuller Manufacturing Co. —

G

G & O Mfg. Co., The.... 150
Garrett Co., Inc., Geo. K. —
General Cable Corp. .... —
General Electric Company 74-75-133
Gibson Co., Wm. ..... —
Gisholt Machine Co. 93
Gits Bros. Mfg. Co. ..... —
Globe-Union, Inc. ..... —
Goodrich Chemical Co., B. F. 139
Gordon Co., Claud S. ... —
Gottscho, Inc., Adolph .. —
Great Lakes Steel Corp.. —
Greenlee Bros. & Co. .... —
Greer Hydraulics, Inc. .. —
Greer Stop Nut Co. ..... —
Gunite Foundries Corp... —

H

H & H Tube & Mfg. Co. 157
Hall Lamp Co., C. M. 121
Handy & Harman 106
Hannifin Corp. ..... —
Hansen Mfg. Co. ..... —
Hapman Conveyors, Inc. 159
Harrison Radiator Div... —
Hartford Special Machinery Co. ..... —
Hartford Steel Ball Co., The 100
Heald Machine Co. ..... —
Henry & Wright ..... —
Herbrand Division, The Bingham - Herbrand Corp. ..... —
Hill Acme Company, The —
Holcroft & Co. 136
Honan-Crane Corp. ..... —
Houghton & Co., E. F. —
Hyatt Bearings Div. .... —
Hydro-Line Mfg. Co. ... —
Hy-Pro Tool Co. ..... —

I

Illinois Tool Works ..... —
Industrial Filter & Pump Mfg. Co. ..... —
Industrial Filtration Co.. 15
Industrial Freezer Div... —
Ingersoll-Rand ..... —
Inland Manufacturing Div. 108
International Nickel Co., Inc. 2

J

Janitrol Div. Surface Combustion Corp. ..... —
Johnson Bronze Co. .... —
Johnson Products, Inc... —
Jones & Laughlin Steel Corp. ..... —
Jones Motrola Corp. 158

K

Kearney & Trecker Corp. 117
Kelsey-Hayes Wheel Co. —
Kent-Owens Machine Co. —
King-Seeley Corporation —
Kingsbury Machine Tool Corp. ..... —
Klem Chemicals, Inc. ... —
Korfund Co., Inc. 118

Advertisers

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L

Lake Shore Engrg. Co.... —
Lamb Electric Company. —
Lancaster Lens Co. ..... —
La Pointe Machine Tool Co. ..... —
Leece-Neville Co., The.. 139
Leeds & Northrup Co. .. —
Leland, Inc., G. H. 134
Libbey-Owens-Ford Glass Co. ..... —
Lincoln Electric Co. .... —
Link-Belt Co. ..... —
Link Engrg. Co. ..... —
Lipe-Rollway Corp. 128
Littell Machine Co., F. J. —
Logan Engineering Co. .. —
Long Manufacturing Div. 111
Lord Manufacturing Co.. 144
Lycoming Div. Avco Mfg. Corp. 44

M

McKay Machine Co., The —
McLouth Steel Corp. 107
Magna Driver Corp. ..... —
Magnaflux Corp. ..... —
Mahon Co., The R. C. ... 151
Malayan Tin Bureau .... —
Mallory & Co., Inc., P. R. 18
Markem Machine Co. ... 148
Master Parts Div., Airtex Prod., Inc. ..... —
Mattison Machine Works —
Mechanics Universal Joint Div. 20
Metalwash Machinery Corp. ..... —
Micromatic Hone Corp... 113
Midland Steel Products Co. 124
Miehle - Dexter Supercharger Div. Dexter Folder Co. ..... —
Milsco Mfg. Co. ..... —
Milwaukee Div. ..... —
Minnesota Mining & Mfg. Co. 135
Moline Tool Co. ..... —
Monarch Machine Tool Co. ..... —
Moraine Products Div... —
Morris Machine Tool Co. —
Morse Chain Co. ..... —
Motch & Merryweather Machinery Co. ..... —
Muskegon Piston Ring Co. ..... —

N

N-A-X Alloy Division... —
Nadella ..... —
Nankervis Co., George L. 104
National Acme Co., The 119
National Broach & Machine Co. ..... —
National Lead Co. 24-25
National Machinery Co... —
National Metal Edge Box Co. ..... —
National Metals Exposition & Congress 154
National Motor Bearing Co. ..... —
National Screw & Mfg. Co. ..... —
National Steel Corporation ..... —
National Tube Div. ..... —
New Britain Machine Co. (Gridley Machine Div.) 46
New Departure Div., Back Cover
Niagara Machine & Tool Wks. ..... —
Northwest Chemical Co., Inc. 126
Norton Company 122-123

O

O & S Bearing & Mfg. Co. 110
Oakite Products, Inc. ... —
Ohio Crankshaft Co. 153
Ohio Division ..... —
Ohio Seamless Tube Div. 78
Orban Co., Inc., Kurt.... —
Osborn Manufacturing Co. ..... —

P

Page Steel & Wire Div., Amer. Chain & Cable Co., Inc. ..... —
Palnut Company, The .. —
Pangborn Corp. ..... —
Parker Appliance Co. ... —
Parker Rust Proof Co. .. 141
Perfect Circle Corp. 95
Perfection Stove Co. ... —
Pesco Products Div. Borg-Warner Corp. ... —
Pheoll Manufacturing Co. —
Pierce Governor Co., Inc. —
Pines Engineering Co., Inc. 143
Pittsburgh Plug & Products Co. 158
Pittsburgh Steel Co. (Thomas Strip Div.)... —
Plastic Research Products ..... —
Polyken Industrial Tapes Dept. of Bauer & Black ..... —
Potter — Johnston Co. .. —
Pratt & Whitney Div., Niles-Bement-Pond Company ..... —
Precision Rubber Products Corp. ..... —
Presstite Engineering Co. —
Purolator Products, Inc. —

R

Rathborne, Hair & Ridgway Box Co. ..... —
Raybestos-Manhattan, Inc. (Equipment Sales Div.) 22-23
Raymond Mfg. Co. ..... —
Reliance Div. Eaton Mfg. Co. ..... —
Reliance Electric & Engrg. Co. ..... —
Republic Steel Corp. (Steel & Tubes Div.).. —
Revere Copper & Brass, Inc. 19
Reynolds Aluminum Fabricating Service ..... —
Reynolds Wire Div. ..... —
Richards Co., J. A. ..... —
Rigidized Metals Corp. .. —
Rinshed-Mason Company —
Rockford Clutch Div. ... —
Ross Gear & Tool Co. ... —
Roto-Finish Co. ..... —
Russell, Burdsall & Ward Bolt & Nut Co. ..... —
Ryerson & Son, Inc., Joseph T. ..... —

S

SKF Industries, Inc. .... —
Saginaw Steering Gear Div. ..... —
Sanborn Company ..... —
Schmieg Industries, Inc.. —
Schwitzer-Cummins Co.. 73
Sealed Power Corporation —
Seneca Falls Machine Co. 120
Service Spring Co. ..... —
Shakeproof Div. ..... —
Sheffield Corp. (Murchey Div.) ..... —
Shuler Axle Co., Inc. .... —
Simmons Fastener Corp. 10
Simonds Abrasive Co. .. —
Sperry Products, Inc. ...146
Spicer Mfg. Div. Dana Corp. ..... —
Standard Oil Co. (Ind) 2nd Cover
Standard Pressed Steel Co. 28
Standard Tube Company 142
Steel Products Engineering Co. 145
Sterling Aluminum Products, Inc. 99
Stewart-Warner Corp. .. 17
Strom Steel Ball Co. 150
Sturtevant Co., P. A. .... —
Subscription Post-Card.. 40
Sun Electric Corp. ..... —
Sun Oil Company ..... —
Sundstrand Machine Tool Co. ..... —
Superior Steel Corp. .... —
Synchro-Start Products, Inc. 158

T

Taylor Dynamometer & Machine Co. ..... —
Taylor-Winfield Corp. ... —
Temco Aircraft Corp. .. —
Tennessee Coal & Iron Div. ..... —
Tenney Engineering, Inc. 140
Texas Company, The ... 4
Thompson-Bremer & Co. —
Thompson Products, Inc. 97
Timken Roller Bearing Co., The 149
Tinnerman Products, Inc. —
Tomkins-Johnson Company, The ..... —
Torrington Co., The .... —
Towmotor Corporation .. —
Transue & Williams Steel Forging Corp. ..... —
Tung-Sol Electric, Inc. .. —
Tuthill Pump Co. 162
Tuthill Spring Co. 112
Twin-Disc Clutch Co. .. —

U

Union Carbide & Carbon Corp. (Bakelite Co.) .. 45
Union Tool Corp. 150
United Specialties Company ..... —
United States Rubber Co. —
United States Steel Corp. ..... —
United States Steel Supply Div. ..... —
Universal Products Co., Inc. 115

V

Vanadium Corp. of Amer. —
Vellumoid Co., The ..... —
Vickers, Inc. ..... —
Victor Manufacturing & Gasket Co. ..... —
Vinco Corp. 132
Voi-Shan Mfg. Co. 125

W

Wagner Electric Corp. .. —
Waldes-Kohinoor, Inc. .. 13
Waterbury Tool Div. Vickers, Inc. ..... —
Waterman Products Co.. —
Waukesha Motor Company ..... —
Wean Equipment Corp. —
Webb Co., Jervis B. .... —
Webber Mfg. Co. ..... —
Wellman Co., S. K. 131
Wellman Bronze & Aluminum Co., The ..... —
Western Felt Works 14
Western Tool & Mfg. Co. —
Westinghouse Electric Corp. ..... —
Wheland Company, The. —
White Dental Mfg. Co., S. S. ..... —
Whittington Pump & Engrg. Corp. ..... —
Williams & Co., J. H. ... 127
Wisconsin Motor Corp... —
Wyman-Gordon 16

Y

Yale & Towne Mfg. Co., The 29
Yates-American ..... —
Young Radiator Company 109
Young Spring & Wire Corp. L. A. ..... —
Youngstown Sheet & Tube Co. ..... —

Z

Zagar Tool, Inc. ..... —
Zollner Machine Works, 3rd Cover

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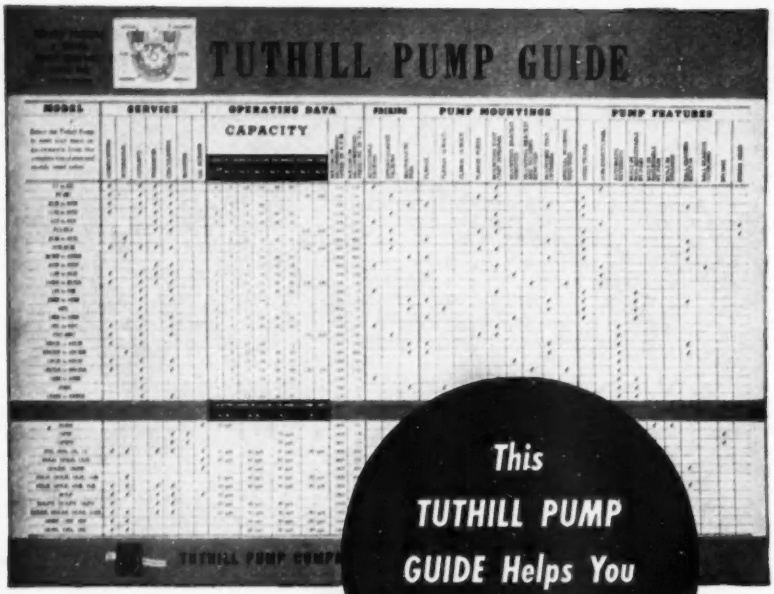

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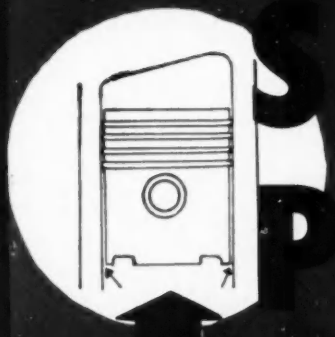

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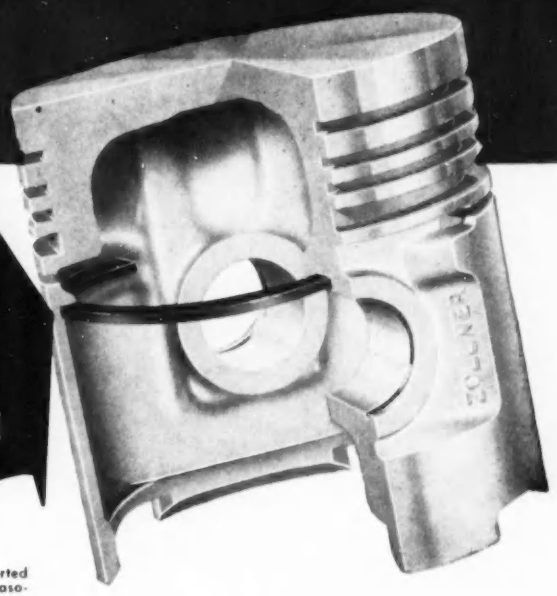

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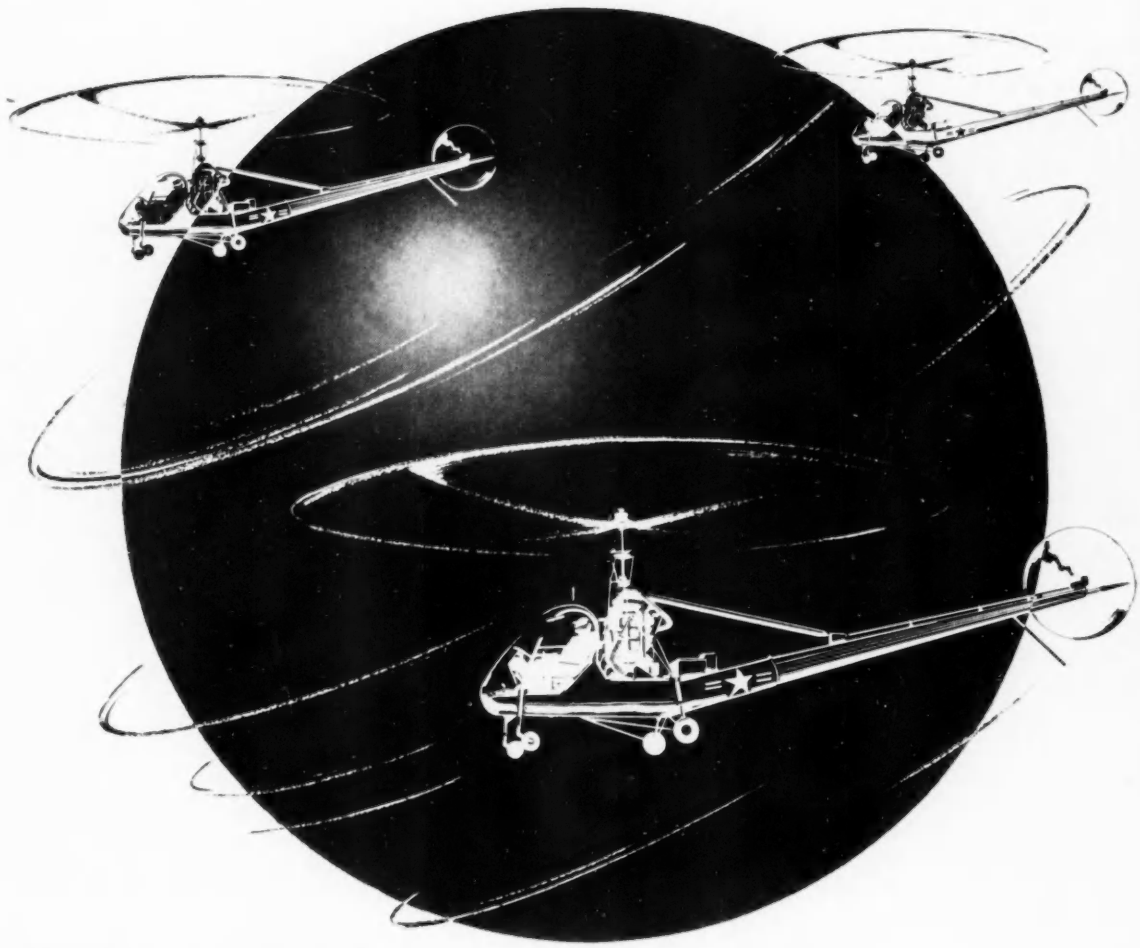

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